



IBM i Performance Data Investigator

Lora Powell – lrpowell@us.ibm.com

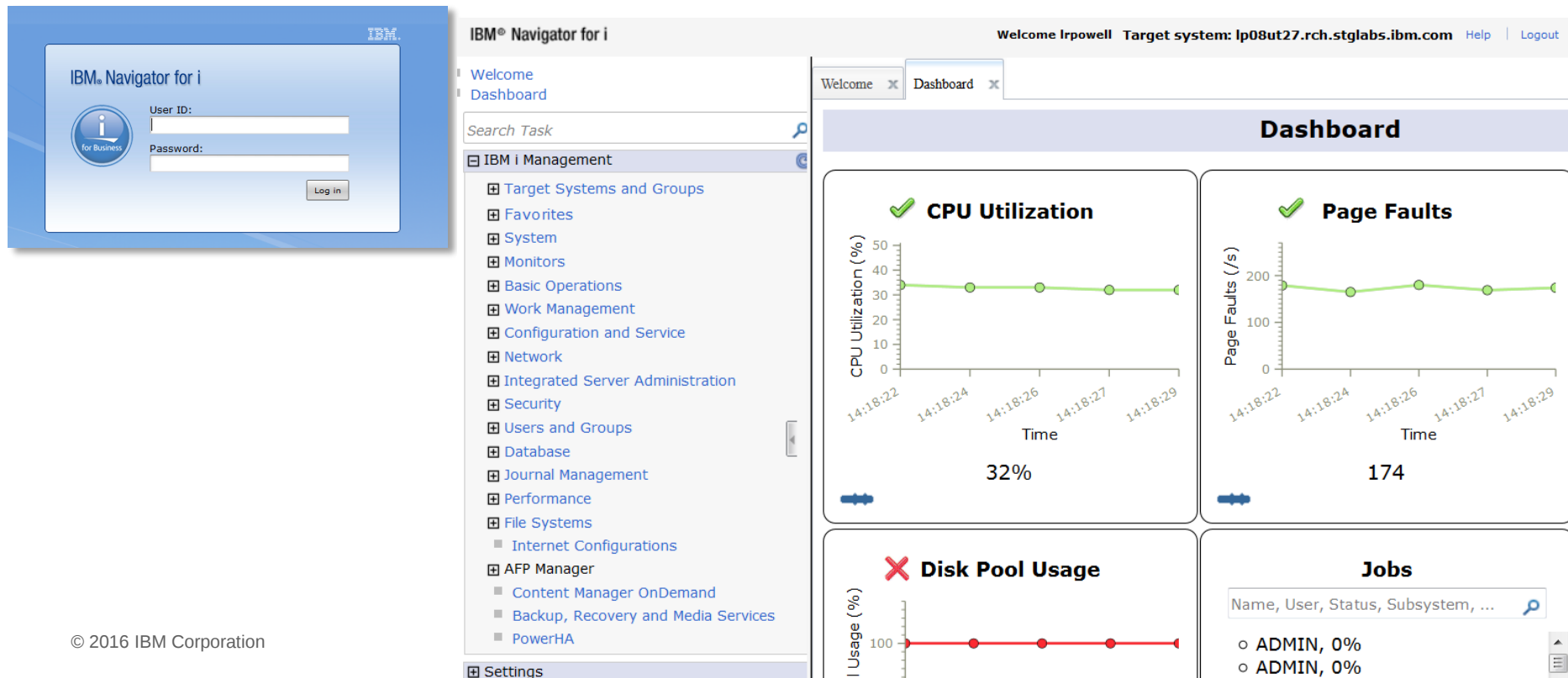


Performance Data Investigator:

- Introduction to PDI
- 7.3 – Better than Ever!
 - Historical Data & Graph History
 - System Monitor – Visualization
 - Dashboard

IBM Navigator for i

- IBM Navigator for i is the Web console for managing IBM i
 - Has much of the function as System i Navigator
 - but with a browser user interface
 - Simply point your browser to `http://systemname:2001`



The image shows the IBM Navigator for i web interface. On the left is a login window titled 'IBM Navigator for i' with fields for 'User ID:' and 'Password:', and a 'Log in' button. The main interface has a sidebar with a tree view of navigation options under 'IBM i Management', including 'Target Systems and Groups', 'Favorites', 'System', 'Monitors', 'Basic Operations', 'Work Management', 'Configuration and Service', 'Network', 'Integrated Server Administration', 'Security', 'Users and Groups', 'Database', 'Journal Management', 'Performance', 'File Systems', 'Internet Configurations', 'AFP Manager', 'Content Manager OnDemand', 'Backup, Recovery and Media Services', and 'PowerHA'. The main content area displays a 'Dashboard' with four panels: 'CPU Utilization' (32%), 'Page Faults' (174), 'Disk Pool Usage' (100%), and 'Jobs' (ADMIN, 0%). Each panel contains a line graph showing data over time from 14:18:22 to 14:18:29. The 'Disk Pool Usage' panel shows a red line at 100% with a red 'X' icon. The 'Jobs' panel shows a search bar and a list of jobs.

IBM® Navigator for i

Welcome lrpowell Target system: lp08ut27.rch.stglabs.ibm.com Help Logout

Welcome x Dashboard x

Dashboard

CPU Utilization 32%

Page Faults 174

Disk Pool Usage

Jobs

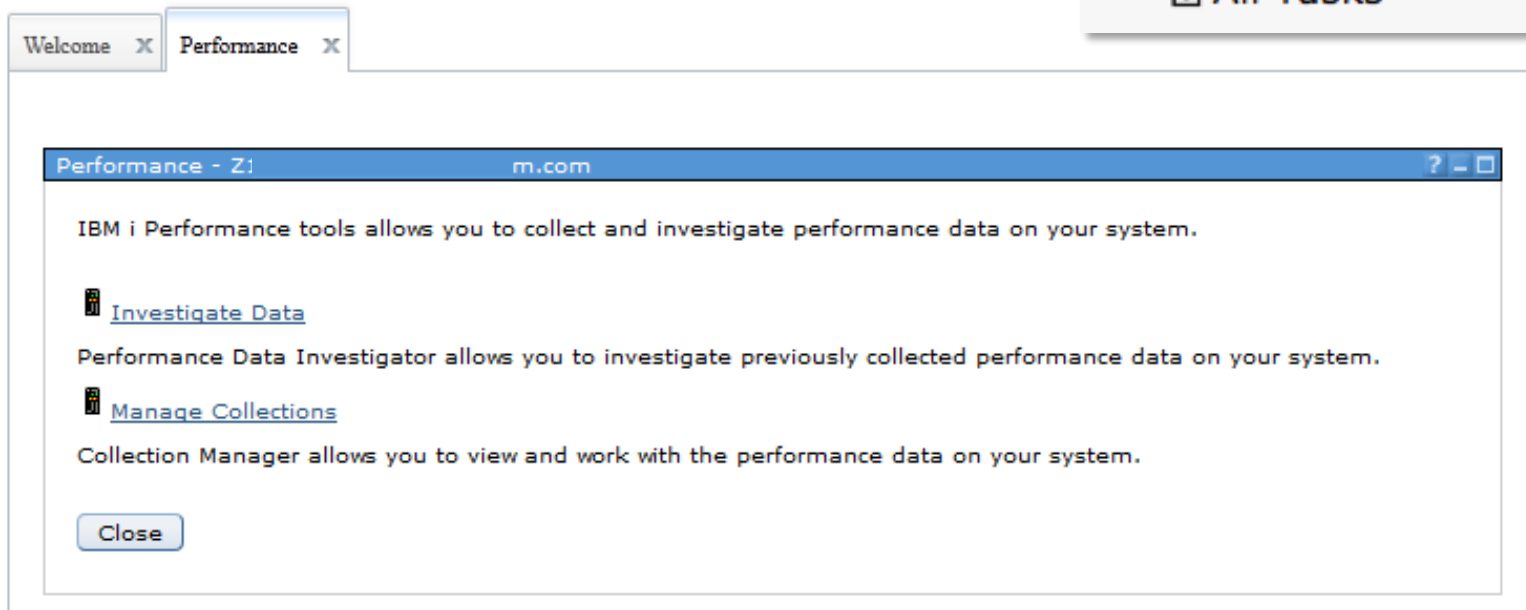
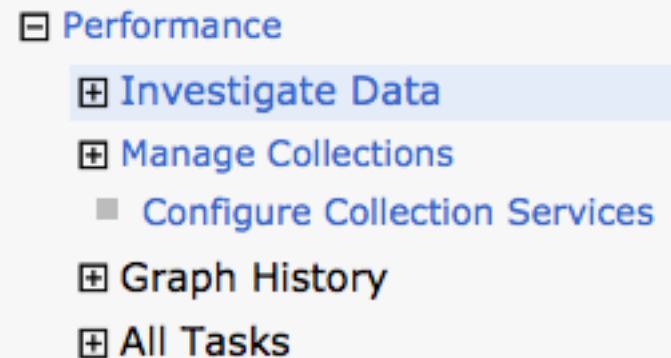
Name, User, Status, Subsystem, ...

- o ADMIN, 0%
- o ADMIN, 0%

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Performance Tasks

- “Performance” is a major function in Navigator
 - Investigate Data
 - Manage Collections
 - And much more!



Packaging: Performance Tools Licensed Program Product

- Included in base OS:
 - IBM i for **Collection Services**, **Health Indicators**, **Monitors** 7.2 and **Graph History** 7.3
- Requires Performance Tools Licensed Program Product
 - 5761PT1 for 6.1
 - 5770PT1 for 7.1 and 7.2
 - **Performance Tools - Manager Feature**
 - **Disk Watcher**, **Performance Explorer**, **Database**, **Batch Model** 7.2
 - Performance Tools - Agent Feature
 - **Performance Tools - Job Watcher**

Prerequisites: Authorizing Users to PDI

- Users need to be authorized to use the investigate data and collection manager performance tasks
- Include users on the QPMCCDATA and QPMCCFCN authorization lists
 - *Can be done via GUI or green screen*

Edit Authorization List

Object : QPMCCDATA Owner : QSYS
Library : QSYS Primary group . . . : *NONE

Type changes to current authorities, press Enter.

User	Object Authority	List Mgt
*PUBLIC	*EXCLUDE	
QSYS	*ALL	X
PDI01	*USE	
PDI02	*USE	
PDI03	*USE	
PDI04	*USE	
PDI05	*USE	
PDI06	*USE	
PDI07	*USE	
PDI08	*USE	
PDI09	*USE	

Qpmccfcn.autl Permissions - Localhost

Object: /QSYS.LIB/Qpmccfcn.AUTL

Type: Authorization list Owner: Qsys Primary group: (None)

Authorities view: Details ▾ Go

Select	Name	AUTL Management	Use	Change	All	Exclude	Custom
☒	(Public)	☐	☐	☐	☐	☒	☐
☐	Qsys	☒	☐	☐	☒	☐	☐

Add... Remove Customize...

Owner Primary Group Secured Objects

OK Cancel Apply

Verify Collection Services is Active

- Collection Services is the foundation for many performance tasks
 - Make sure Collection Services is active (it is started by default)

Collectors

+ Disk Watcher

+ Job Watcher

Collection Services

■ Active Collection Services Collections

■ Collection Services Collections

■ Collection Services Status

■ Configure Collection Services

■ Cycle Collection Services

■ Start Collection Services

■ Stop Collection Services

Collection Services Status

Status:	Started
Library:	QPFRDATA
Collection object:	Q058000002
Collection profile:	Standard plus protocol
Started:	Wed Feb 27 00:00:02 CST 2013
Cycle time:	00:00:00
Default collection interval:	00:05:00

OK



Prerequisites – Create Database Files During Collection

- **PDI requires data in the Collection Services DB2 files**
 - The default is to create the database files during performance data collection
 - If you have turned this off, you will not be able to view performance data with PDI until the data is created in the files
 - Recommended to leave this setting at the default

Command interface:

The “Create Database files” option for the performance collection should be *YES

```
CFGPFRCOL command - CRTDBF (*YES)
```

The screenshot shows the 'Configure Collection Services' window with the 'General' tab selected. The 'Library' is set to 'QPFRDATA'. The 'Default collection interval' is set to 15 seconds. Under the 'Cycling' section, 'Cycle every day at' is set to 12:00 AM and 'Cycle every' is set to 24 hours. Under the 'System options' section, the 'Create database files during collection' checkbox is checked and highlighted with a red box. Other options include 'Enable system monitoring' (checked), 'Create performance summary data when collection is cycled' (checked), and 'Send PM Agent data to IBM' (unchecked).

Investigate Data

Performance

Investigate Data

- Investigate Data Search
- + Health Indicators
- + Monitor
- + Collection Services
- + Database
- + Job Watcher
- + Disk Watcher
- + Performance Explorer
- + Batch Model

Performance -

IBM i Performance tools allows you to collect and investigate per



[Investigate Data](#)

Performance Data Investigator allows you to investigate previously collected performance data on your system.

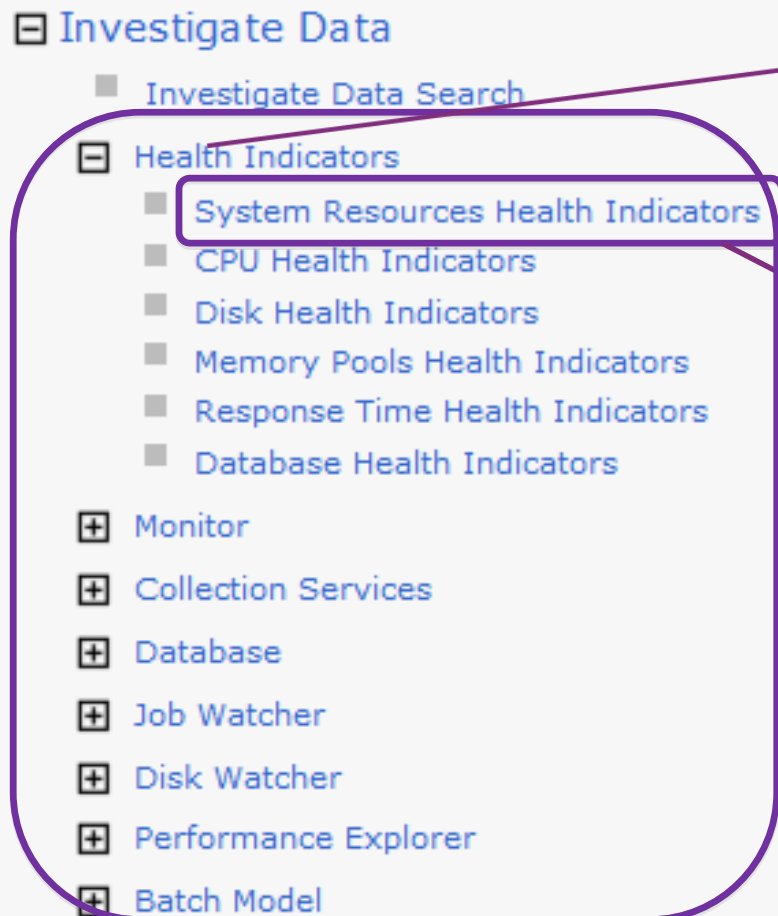


[Manage Collections](#)

Collection Manager allows you to view and work with the performance data on your system.

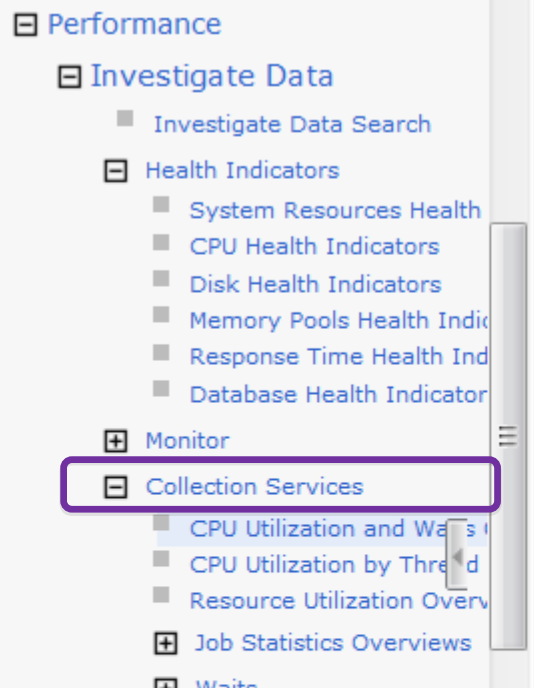
Close

Investigate Data



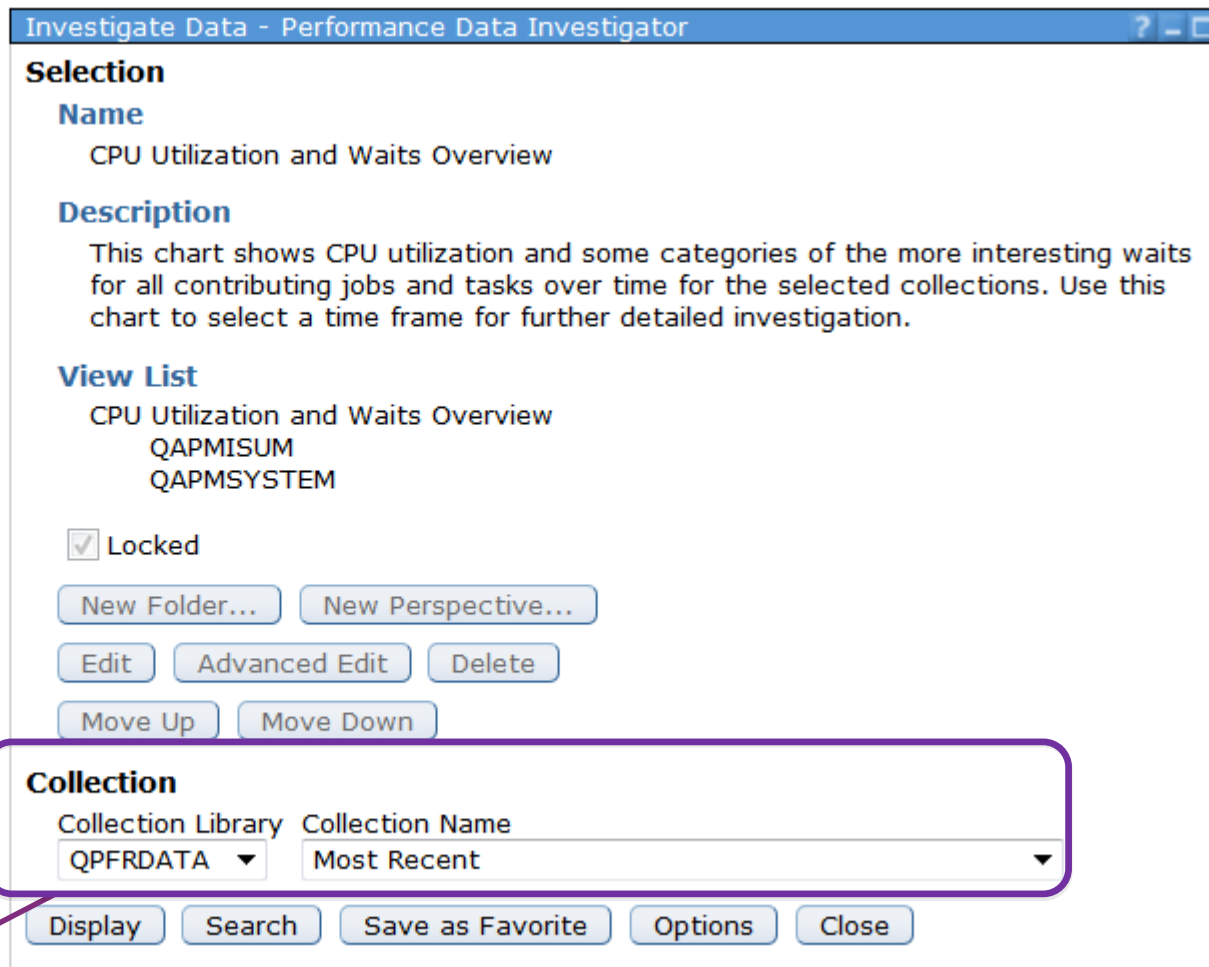
Content Package is a set of perspectives that share a commonality (major theme)

Perspectives are a logical grouping of similar or related views that benefit from being rendered side-by-side for reference or context.



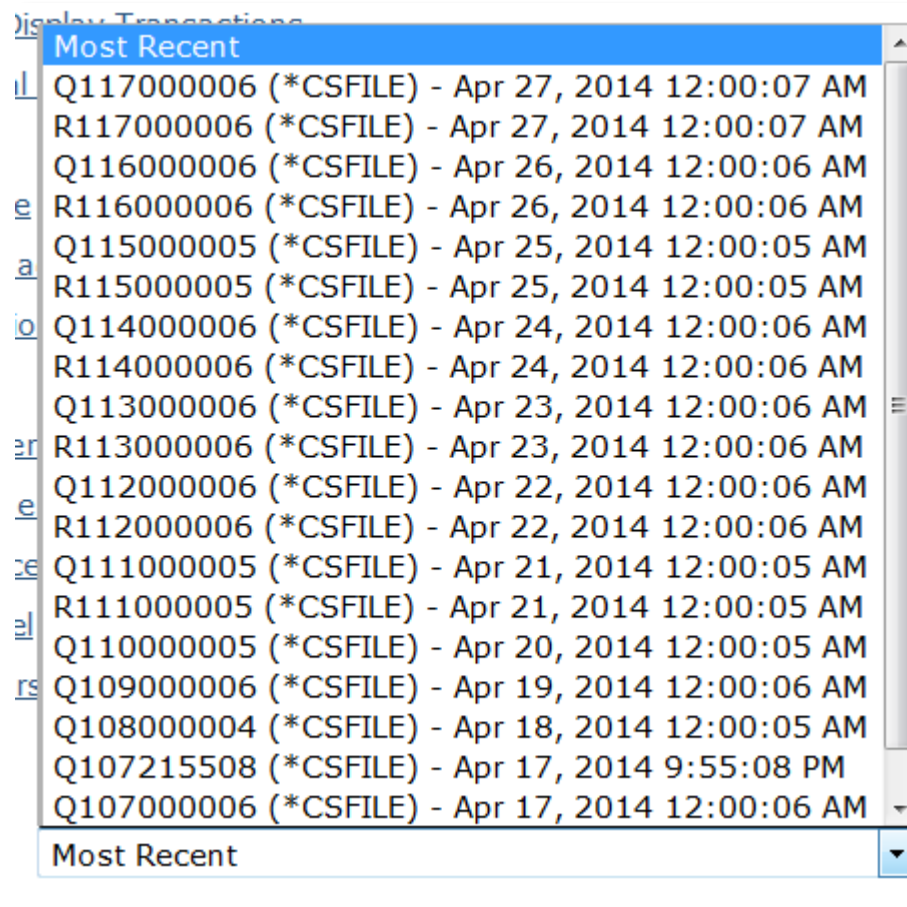
The Collection boxes allow you to specify which collection you want to work with.

Only collections valid for the type of chart you select will be displayed.



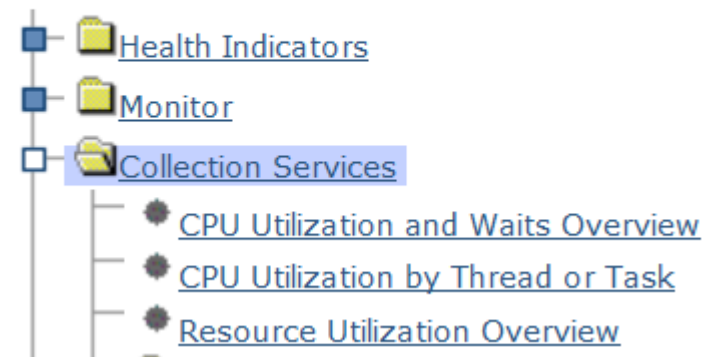
Selecting a Collection

- Collections have the date and time to help you identify the one you are interested in
- Note Q* and R* collections
 - R* collections were added in 7.2
 - System monitor data

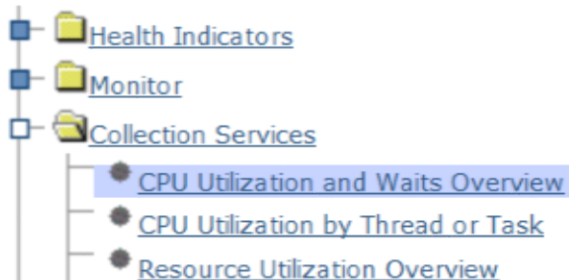


Starting Points

Perspectives



Perspectives



Selection

Name

CPU Utilization and Waits Overview

Description

This chart shows CPU utilization and some categories of the more interesting waits for all contributing jobs and tasks over time for the selected collections. Use this chart to select a time frame for further detailed investigation.

View List

Starting Points

Investigate Data - Performance Data Investigator ?

Perspectives

-  [Health Indicators](#)
-  [Monitor](#)
-  [Collection Services](#)
 -  [CPU Utilization and Waits Overview](#)
 -  [CPU Utilization by Thread or Task](#)
 -  [Resource Utilization Overview](#)
 -  [Job Statistics Overviews](#)
 -  [Waits](#)

Selection

Name

Resource Utilization Overview

Description

Charts that show utilizations and rates for some of the more common collection metrics on an interval by interval basis. Use this information to find and compare relationships and select a time frame for more detailed investigation.

View List

Resource Utilization Percentages
 QAPMSYSTEM
 QAPMDISK
 Resource Utilization Rates
 QAPMJSUM
 QAPMSYSTEM
 QAPMPOOLB

Resource Utilization Overview

Summary for general overall health:

- CPU Utilization
- Disk Utilization
- Disk Busy
- 5250 Transactions
- I/Os per Second
- Page Faults

Resource Utilization Overview

Perspective [Edit](#) [View](#) [History](#)

Collection

Name(s): CS228229ND
Library: COMMON
Type: Collection Services File Based Collection
File level: 28

Time

Start: Feb 28, 2008 12:00:02 AM
End: Feb 29, 2008 12:00:00 AM

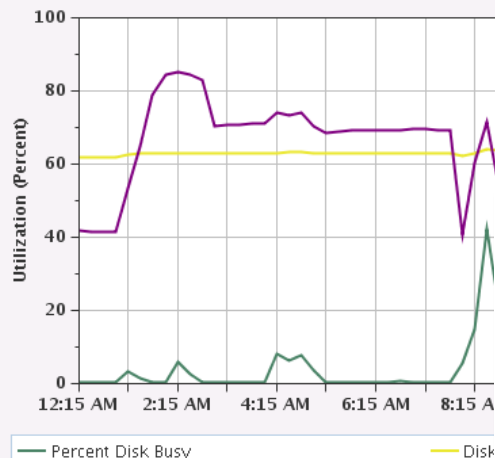
System

Name: RCHASTND
Release: V6R1M0

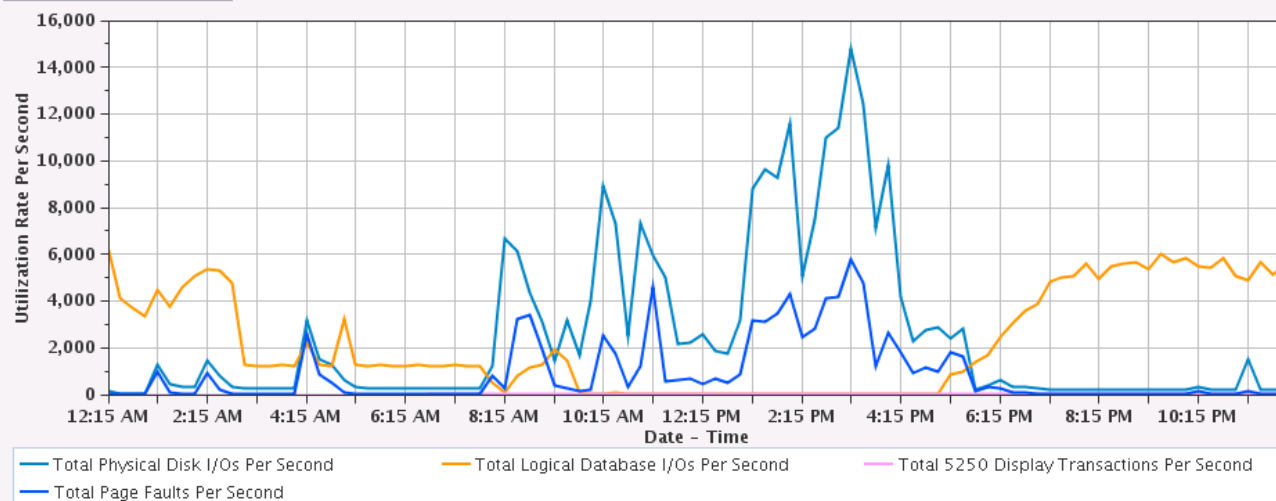
Resource Utilization Percentages

--- Select Action ---

Resource Utilization Percentages



Resource Utilization Rates



CPU Utilization and Waits Overview

CPU Utilization and Waits Overview

Perspective Edit View History

Collection

Name(s): CS228229ND

Library: COMMON

Type: Collection Services File Based Collection

File level: 28

Time

Start: Feb 28, 2008 12:00:02 AM

End: Feb 29, 2008 12:00:00 AM

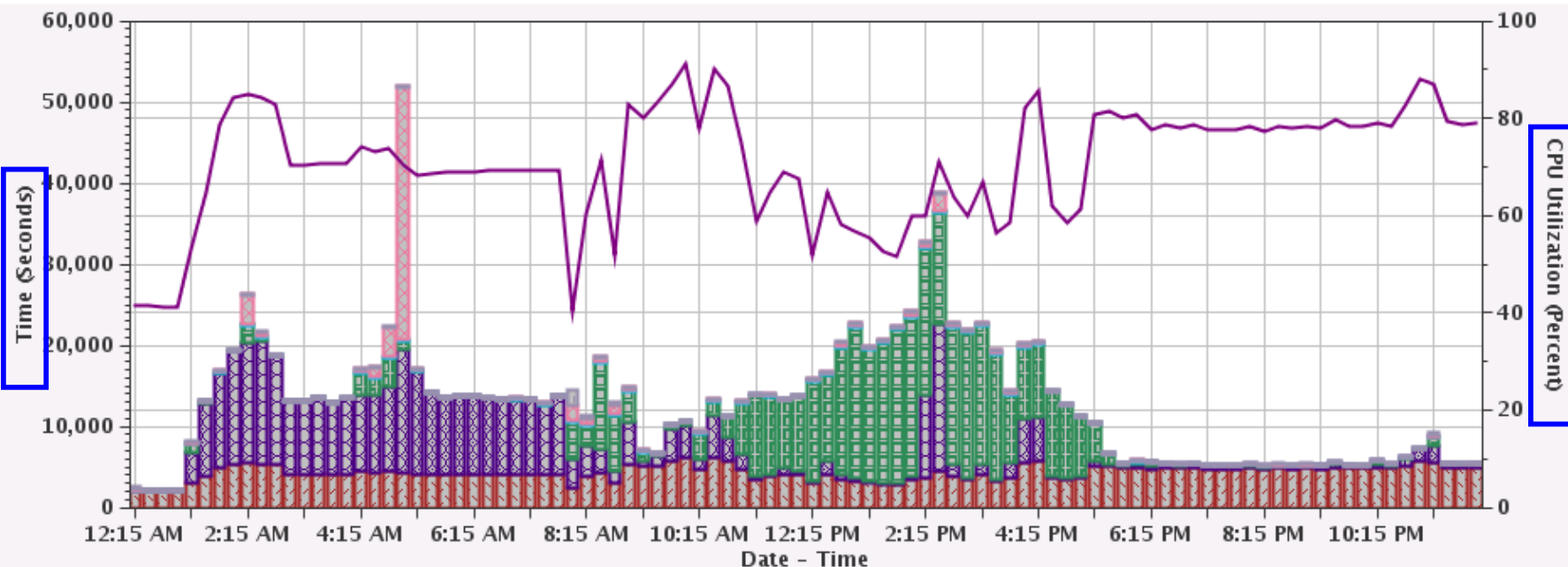
System

Name: RCHASTND

Release: V6R1M0

--- Select Action --- ▼

CPU Utilization and Waits Overview



Dispatched CPU Time

CPU Queuing Time

Disk Time

Journaling Time

Operating System Contention Time

Lock Contention Time

Ineligible Waits Time

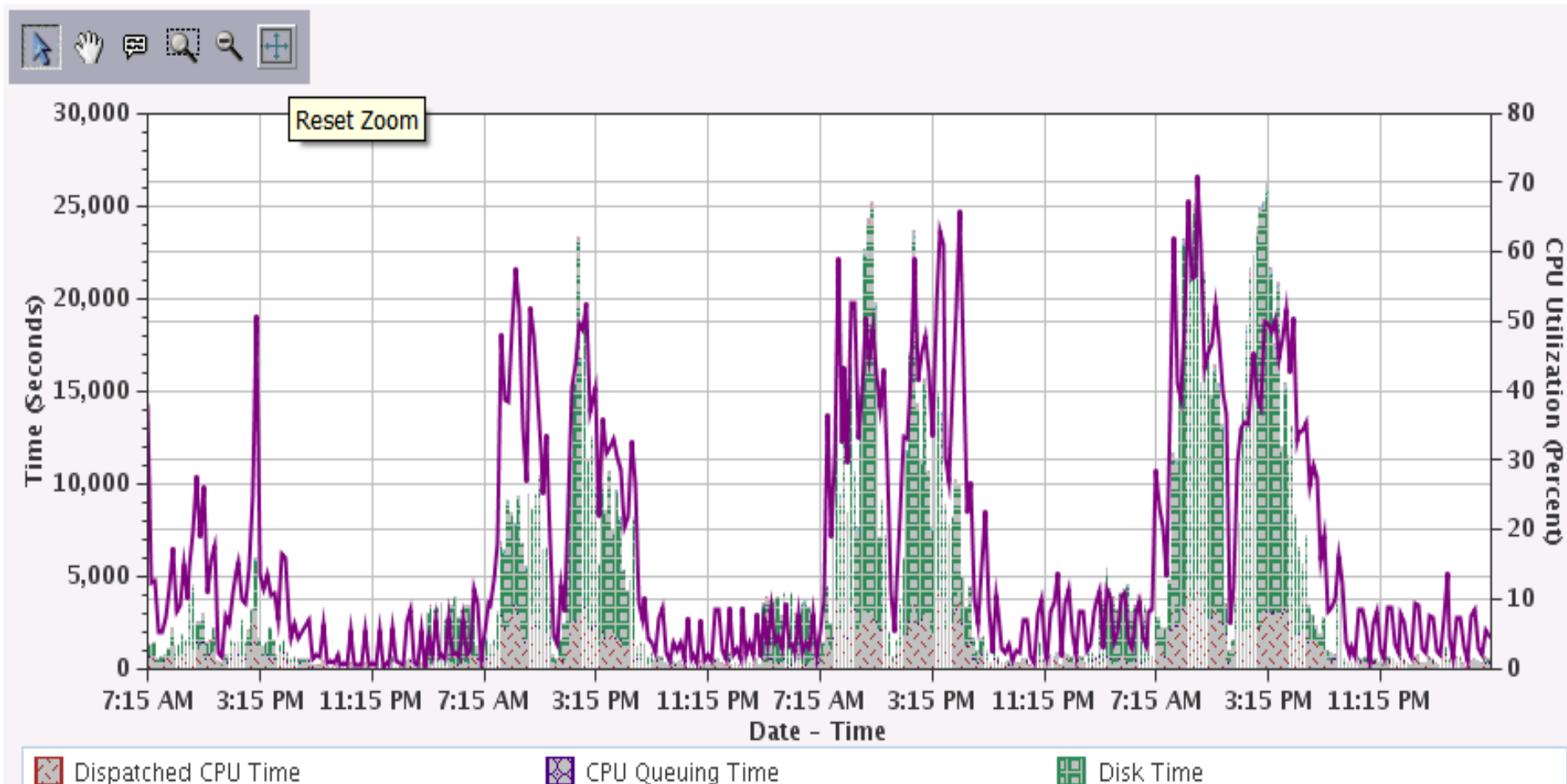
Partition CPU Utilization

A More Interesting Example

4 days of more interesting performance data

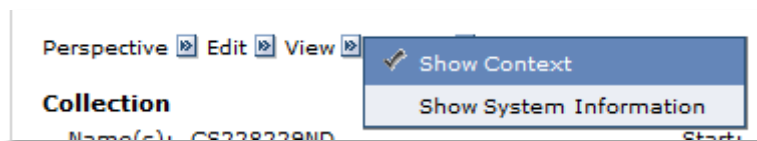
Observe the pattern...

CPU Utilization and Waits Overview



View Collection and System Details

Toggle on/off the detailed information regarding the collection or the system from which the collection originated



CPU Utilization and Waits Overview

Perspective Edit View History

Collection	Time	System
Name(s): Q234000002	Start: Aug 22, 2013 12:00:02 AM	Name: ETC3T1
Library: QPFRDATA	End: Ongoing	Release: V7R1M0
Type: Collection Services File Based Collection		
File level: 36		

System Information

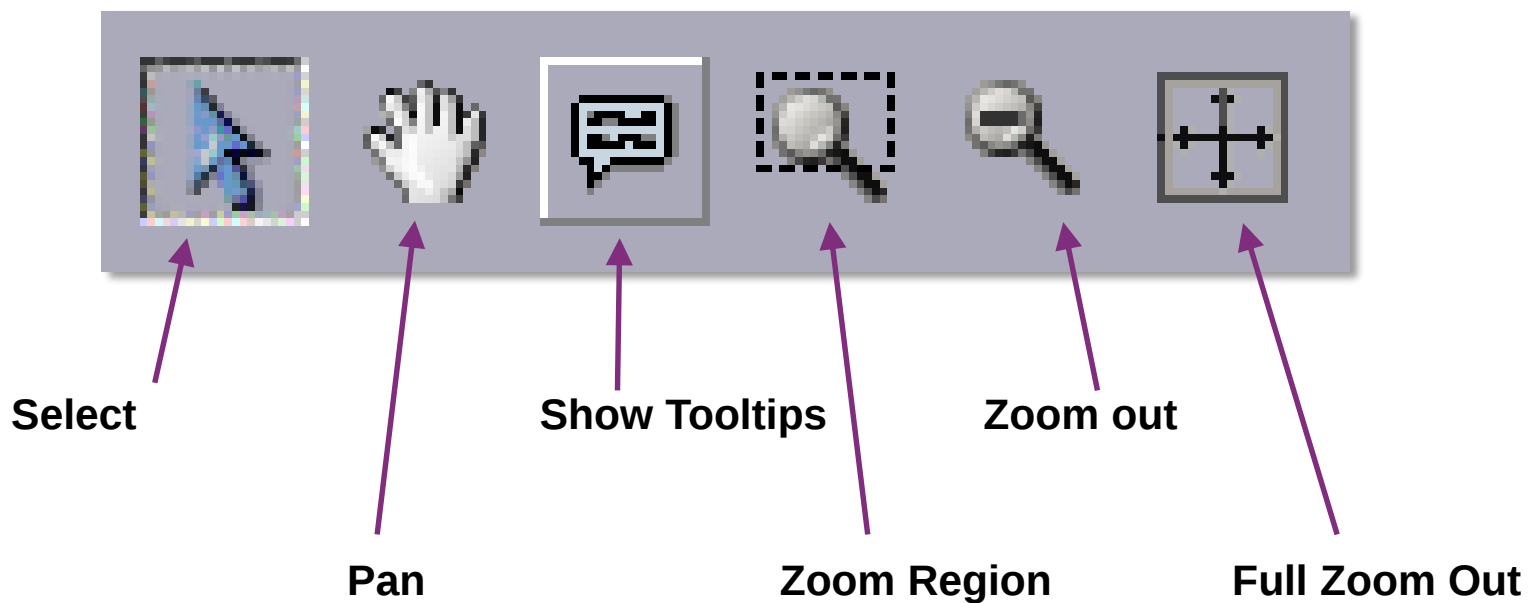
Name:	ETC3T1	Total Processors:	Not Available	Interactive Threshold:	100%
Release:	V7R1M0	Processors / Cores Active:	4	System ASP Capacity:	88.89 GB
Type:	7998	Available Processors:	Not Available	Hypervisor Memory:	1,152 MB
Model:	61X	Virtual Processors:	1	Primary Partition:	0
Serial Number:	10-065FA	Installed Processor Count:	4	Partition ID:	21
Processor Feature Code:	52BE	Processor Units (allocated to partition):	0.5	Partition Count:	3
Processor Feature:	8400	Processor Sharing/Capped:	Yes / No	Partition Memory:	8 GB
Generated On:	ETC3T1				

Show/hide
Context

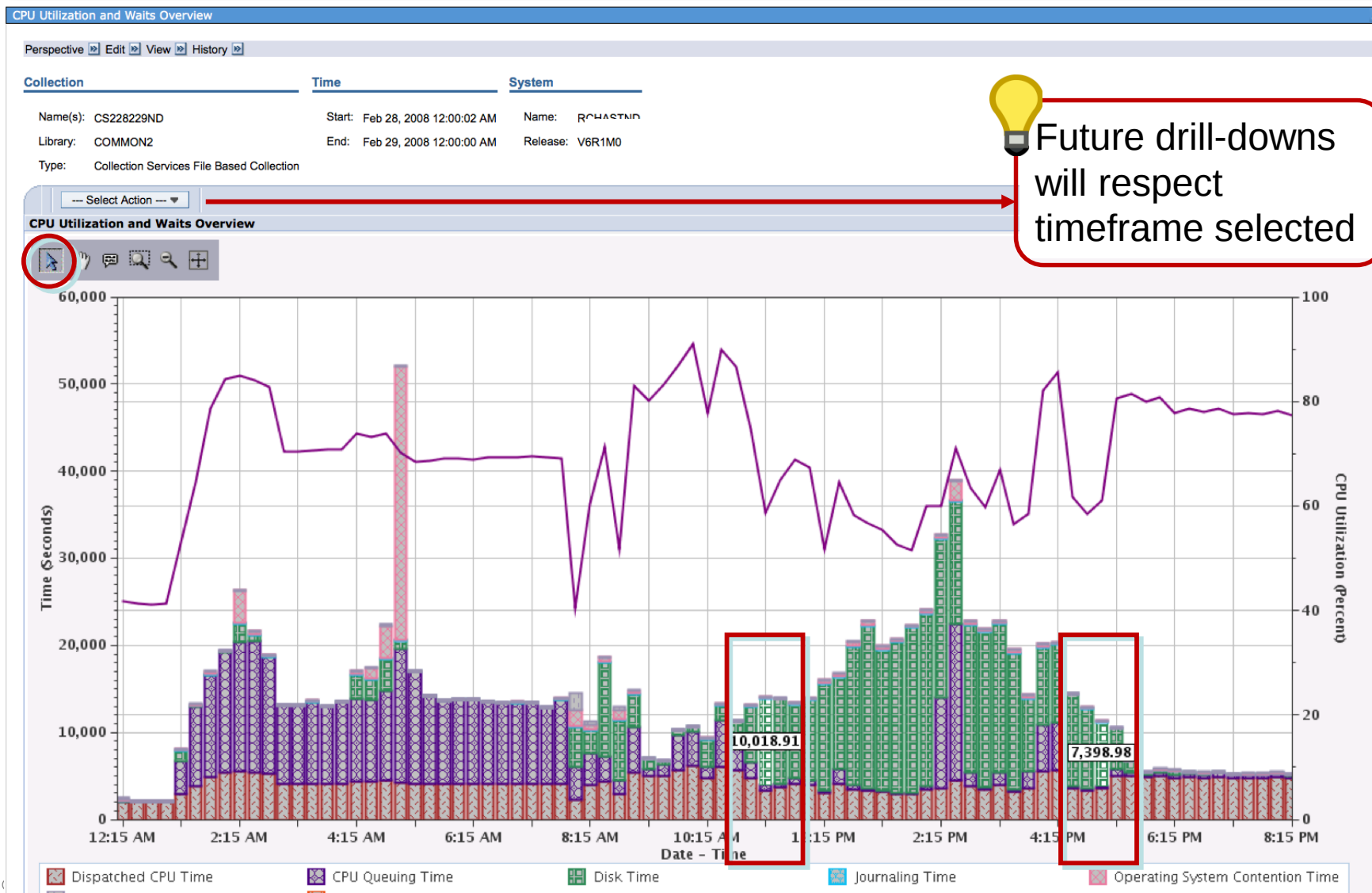
Show/hide
System
Information

Provides quick access to system information from Collection Services QAPMCONF file for the Collection being viewed

Tools to Interact with the Charts



Selection



Tool Tips



CPU Utilization and Waits Overview

Perspective Edit View History

Collection

Time

System

Name(s): CS228229ND

Start: Feb 28, 2008 12:00:02 AM

Name:

Library: COMMON2

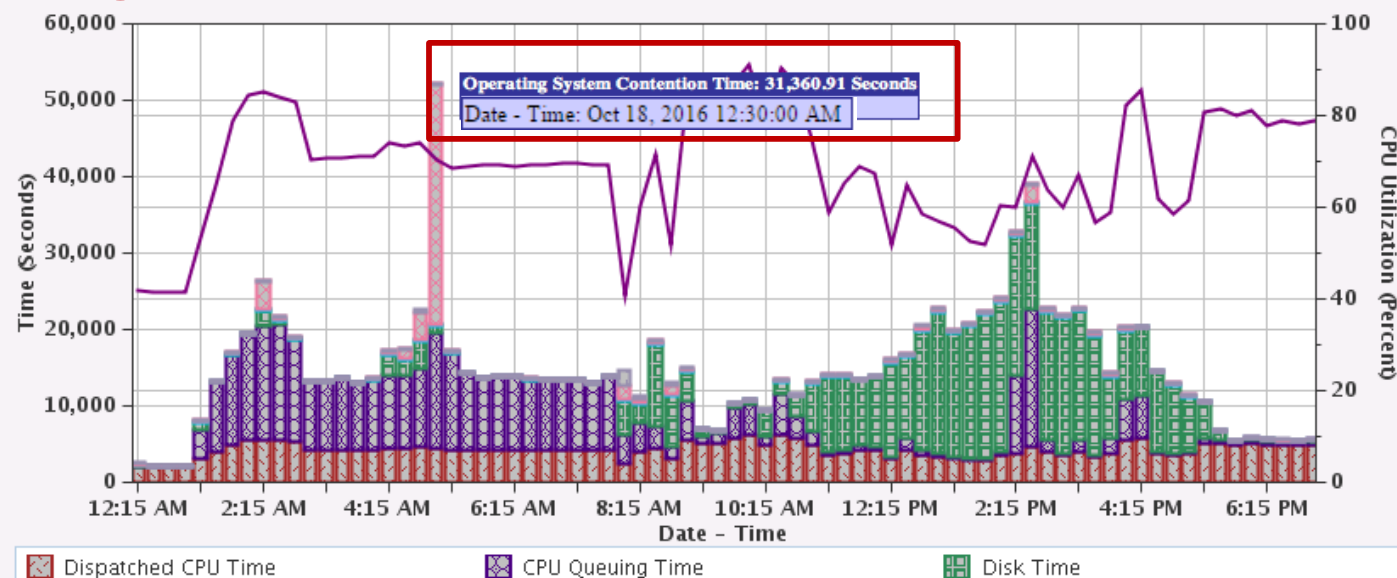
End: Feb 29, 2008 12:00:00 AM

Release: V6R1M0

Type: Collection Services File Based Collection

--- Select Action ---

CPU Utilization and Waits Overview



Zoom Region



CPU Utilization and Waits Overview

Perspective Edit View History

Collection

Name(s): CS228229ND

Library: COMMON2

Type: Collection Services File Based Collection

Time

Start: Feb 28, 2008 12:00:02 AM

End: Feb 29, 2008 12:00:00 AM

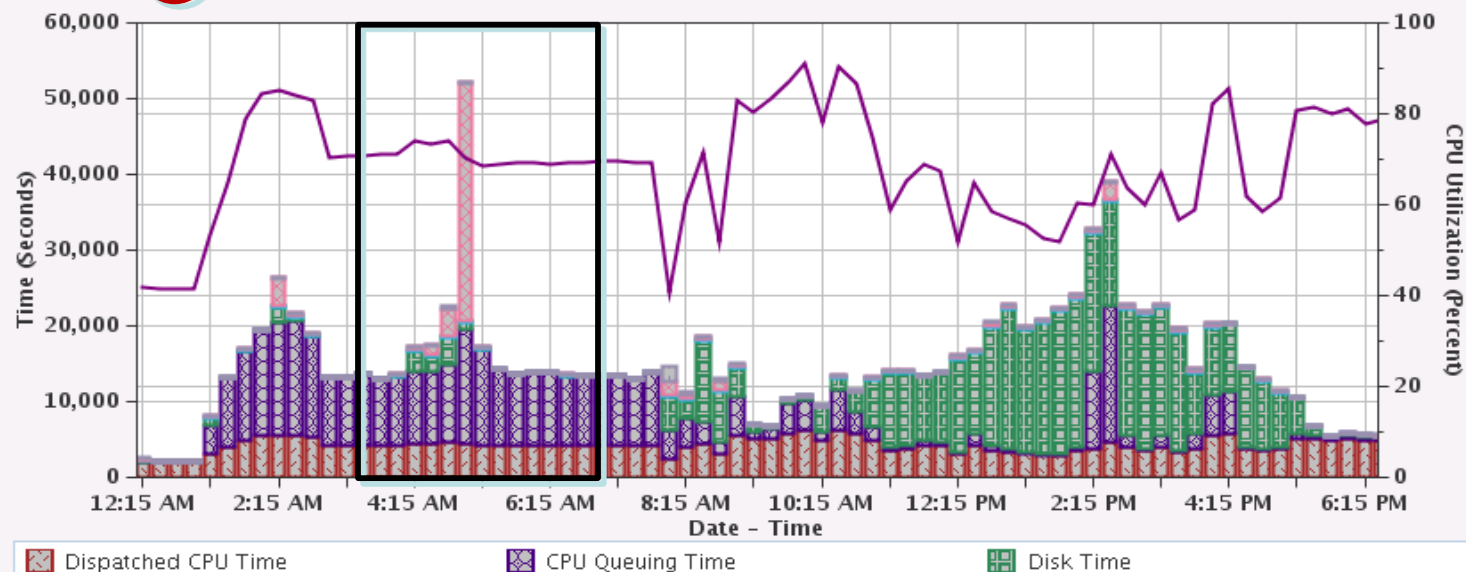
System

Name:

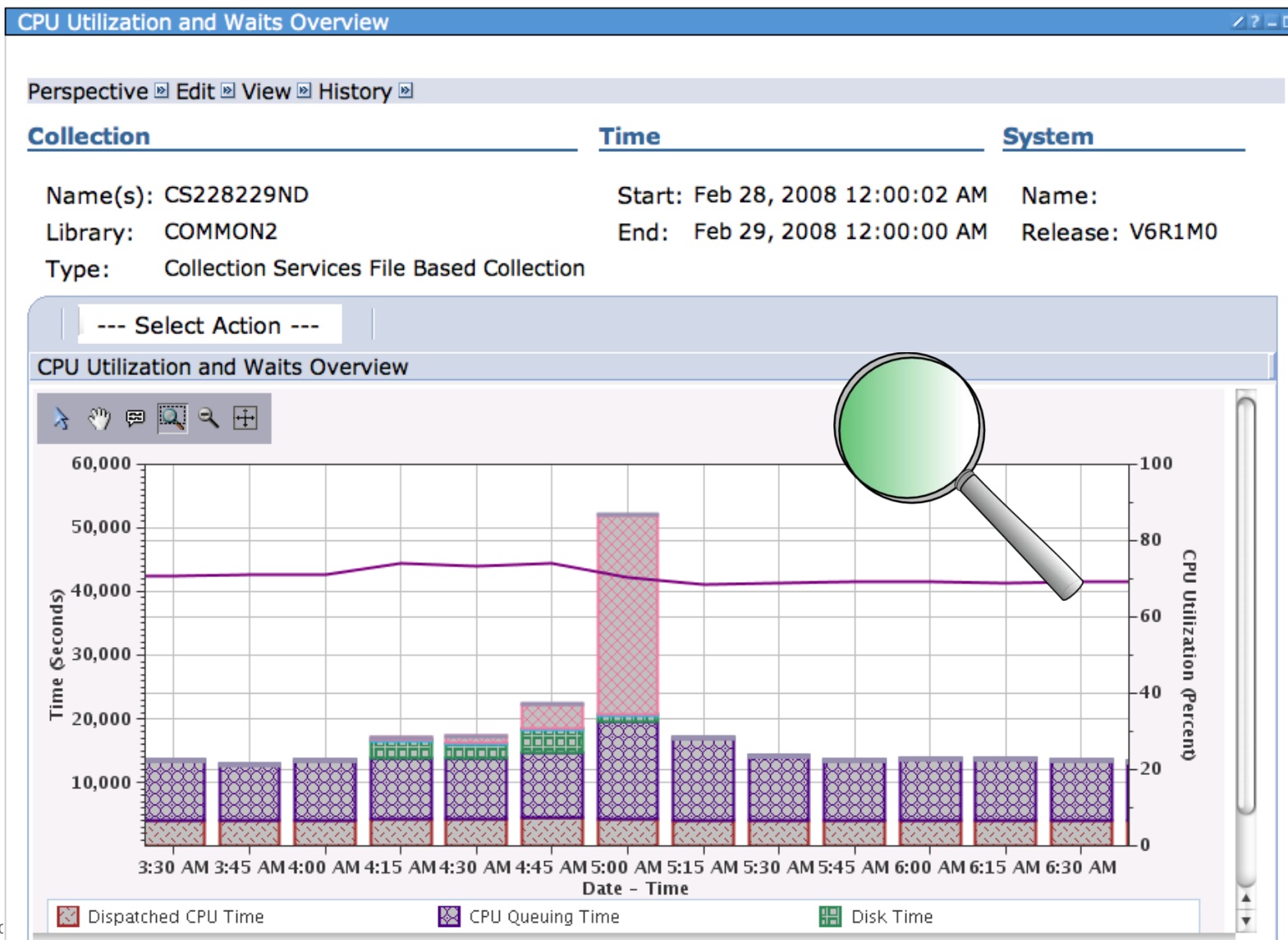
Release: V6R1M0

--- Select Action ---

CPU Utilization and Waits Overview



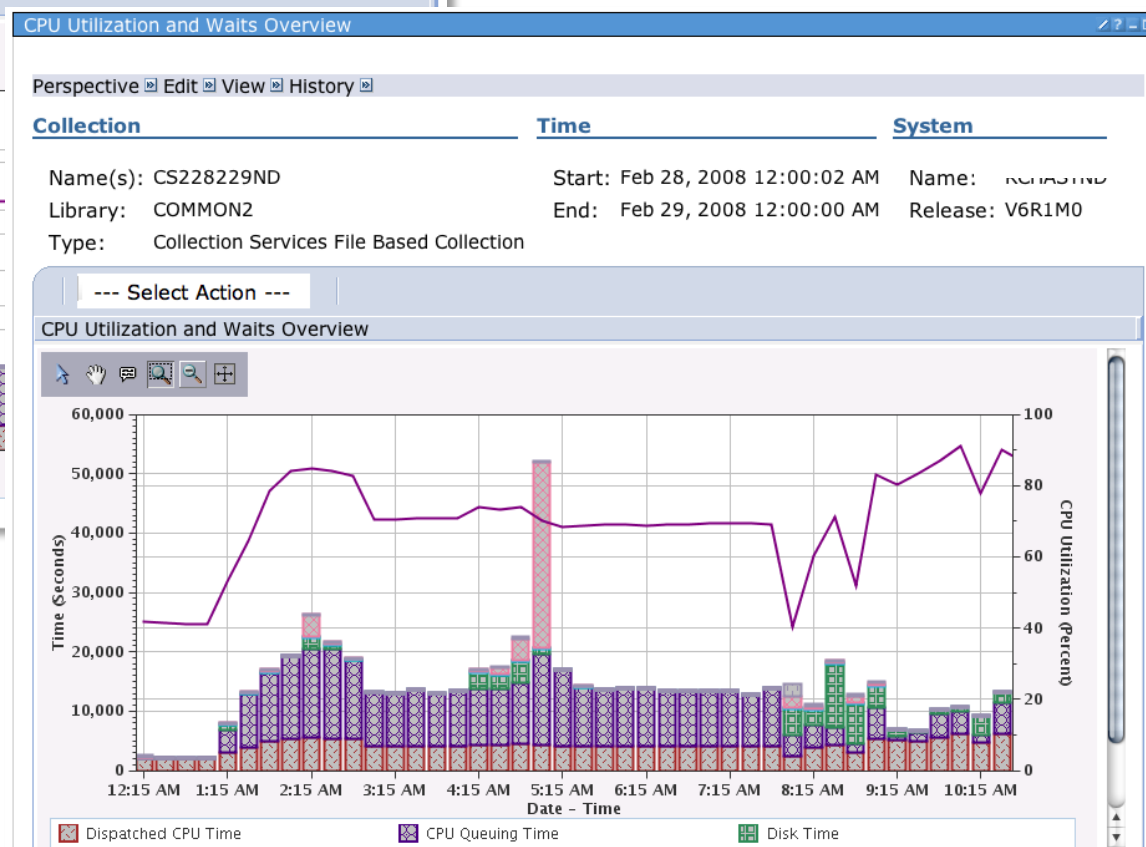
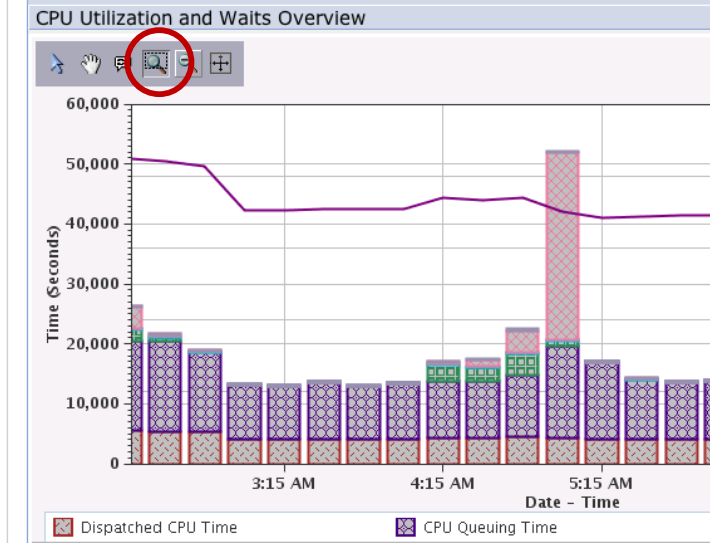
Zoom Region Results



Zoom Out



Zoom out expands the graph each time it is clicked



Full Zoom Out



A way to quickly view
entire collection
characteristics

CPU Utilization and Waits Overview

Perspective Edit View History

Collection

Name(s): CS228229ND

Library: COMMON2

Type: Collection Services File Based Collection

Time

Start: Feb 28, 2008 12:00:02 AM

End: Feb 29, 2008 12:00:00 AM

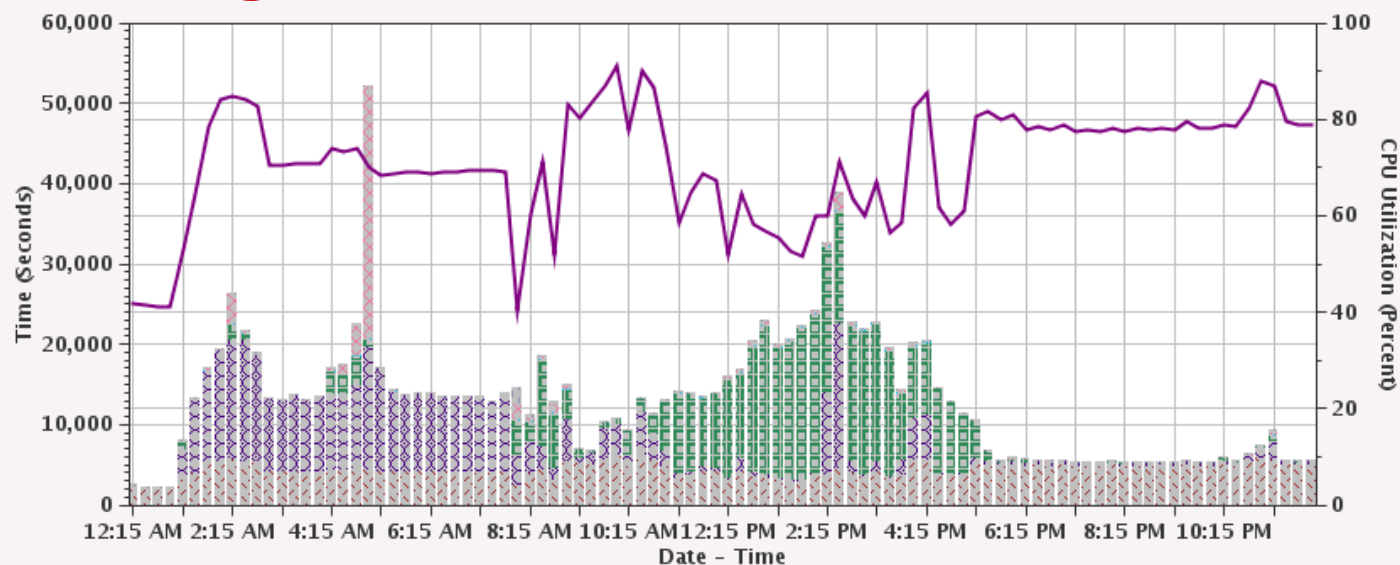
System

Name: RCHASTND

Release: V6R1M0

--- Select Action ---

CPU Utilization and Waits Overview



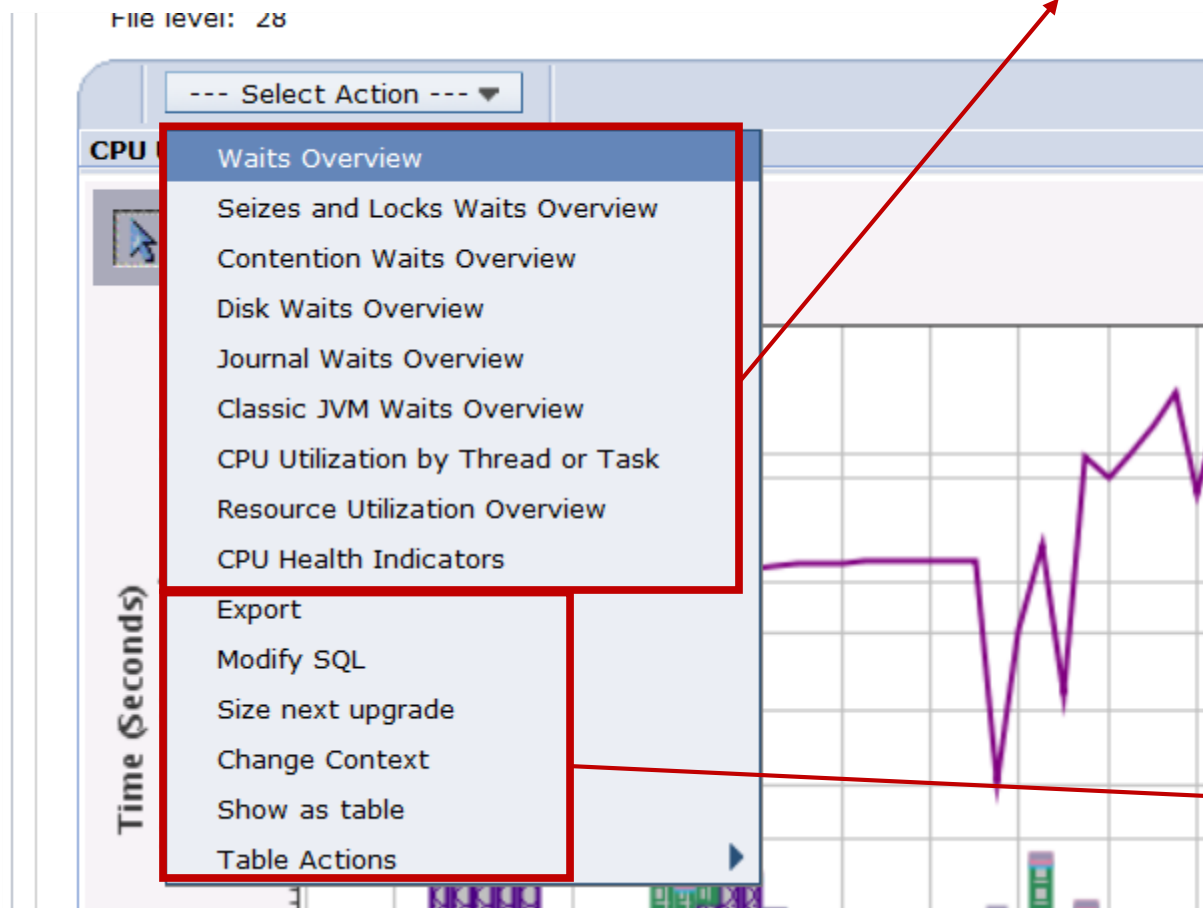
Dispatched CPU Time

CPU Queuing Time

Disk Time

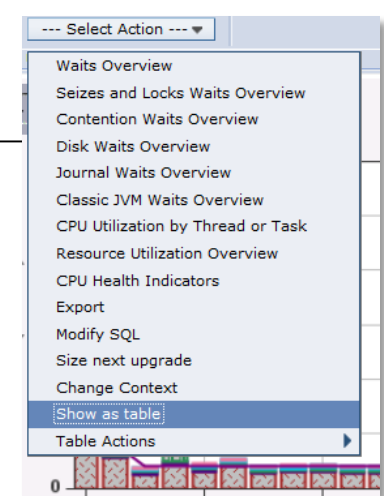
Drill-down

Graph options for next step in analysis



Other options to work with data or refine graphs

Show as Table



CPU Utilization and Waits Overview

Perspective Edit View History

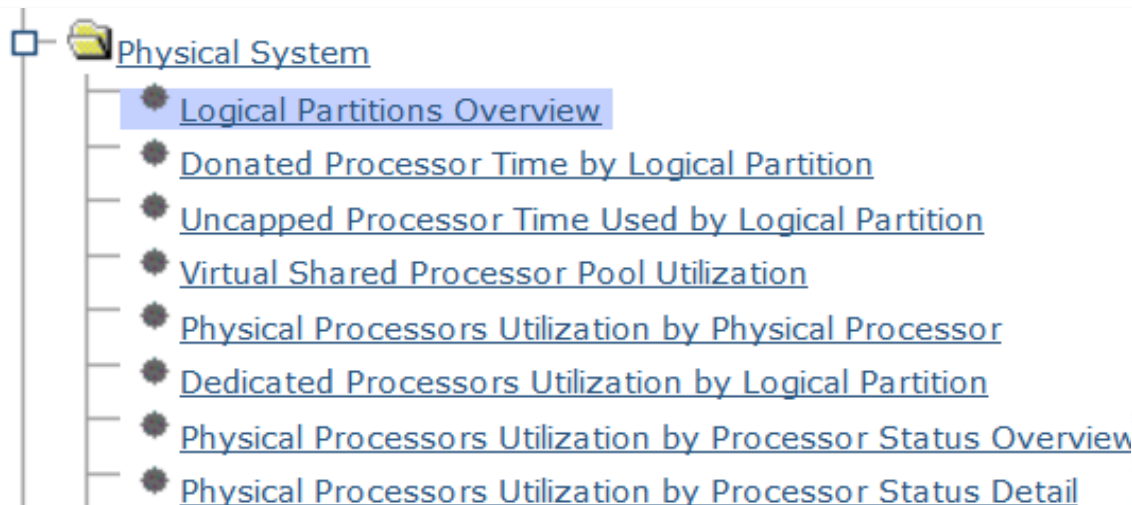
Select	Interval Number ^	Date - Time ^	Partition CPU Utilization (Percent) ^	Dispatched CPU Time (Seconds) ^	CPU Queuing Time (Seconds) ^	Disk Time (Seconds) ^	Journaling Time (Seconds) ^	Operating System Contention Time (Seconds) ^
☐	1	Feb 28, 2008 12:15:00 AM	41.65	2125.7	12.25	64.4	35.71	22.6
☐	2	Feb 28, 2008 12:30:00 AM	41.4	2110.42	12.16	10.72	34.68	3.62
☐	3	Feb 28, 2008 12:45:00 AM	41.14	2096.73	12.38	5.32	35.3	3.5
☐	4	Feb 28, 2008 1:00:00 AM	41.23	2104.27	11.71	5.67	35.35	3.29
☐	5	Feb 28, 2008 1:15:00 AM	52.99	2959.23	3759.2	1180.33	47.49	141.01
☐	6	Feb 28, 2008 1:30:00 AM	64.62	3847.86	9061.6	217.47	32.11	113.34
☐	7	Feb 28, 2008 1:45:00 AM	78.58	4853.43	11796.74	41.63	41.27	308.02
☐	8	Feb 28, 2008 2:00:00 AM	84.22	5367.69	13984.72	23.12	52.58	35.85
☐	9	Feb 28, 2008 2:15:00 AM	84.89	5469.88	14931.39	2163.59	69.93	3686.04
☐	10	Feb 28, 2008 2:30:00 AM	84.07	5406.56	15063.64	697.16	72.47	399.18
☐	11	Feb 28, 2008 2:45:00 AM	82.82	5272.46	13472.69	57.49	48.64	46.06
☐	12	Feb 28, 2008 3:00:00 AM	70.36	4141.47	9068.85	20.63	1.19	22.3
Total: 96 Filtered: 96								

Physical System Charts – Frame view of Performance!

Collection Services has the ability to collect certain high-level cross-partition processor performance metrics for all logical partitions on the same single physical server regardless of operating system.

This is available on Power 6 and above servers.

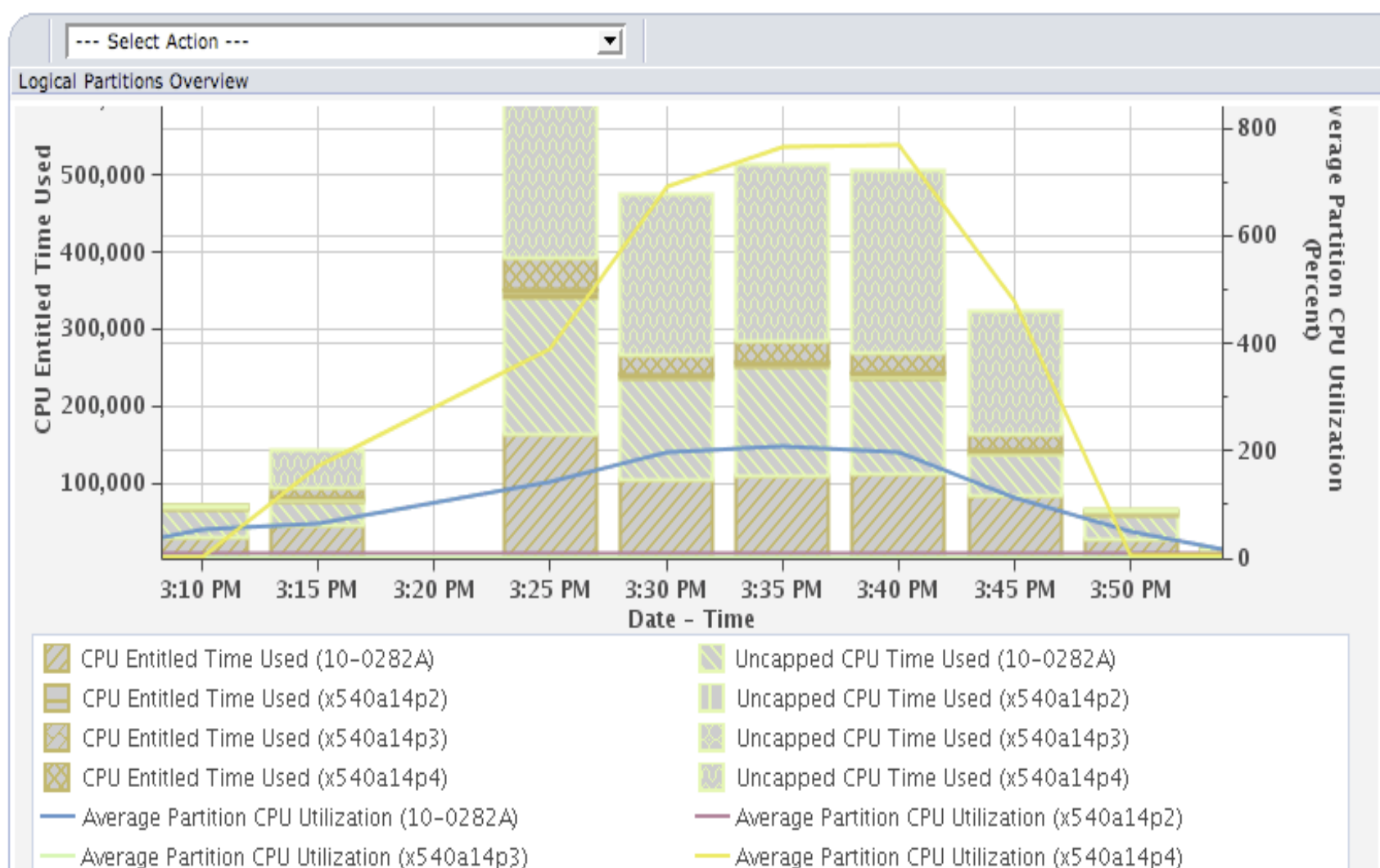
When this data is available, it can be viewed via several perspectives found under "Physical System".



HMC option to enable performance collection must be turned on for the IBM i partition to collect the data



Logical Partitions Overview

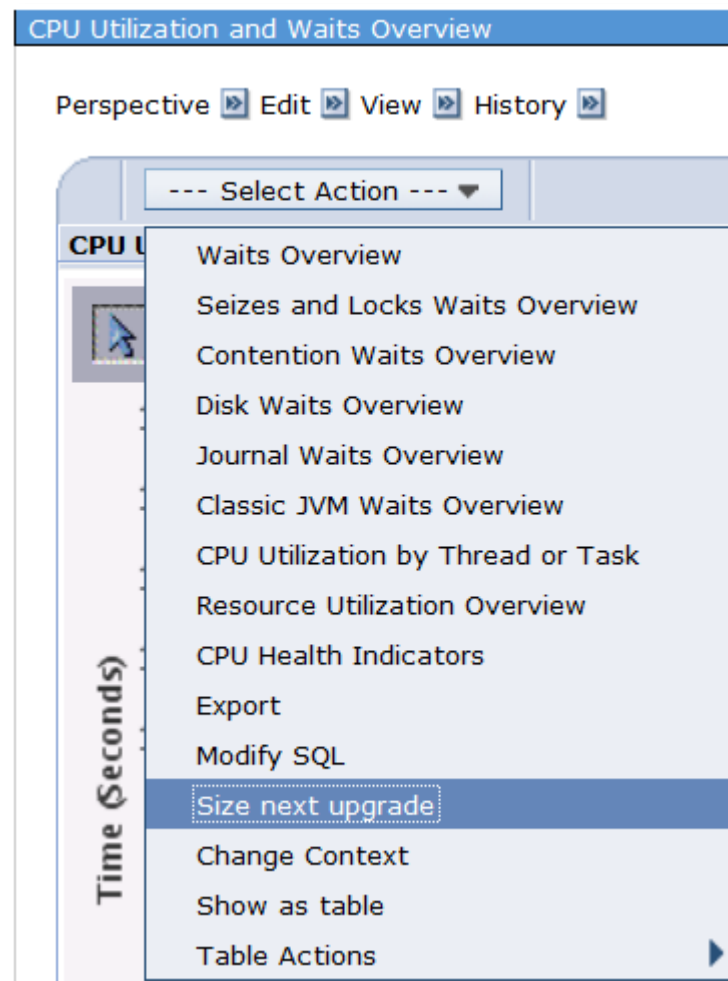


Size Next Upgrade

Send data directly to the IBM Workload Estimator

Takes the measured data from Collection Services and inputs it to the IBM Workload Estimator (WLE)

Intended for a one-time sizing activity



Investigate Data Search

Type at least 3 non-empty characters

☐ Case Sensitive
 ☐ Whole Words Only

Search In:

☐ Package Name
 ☐ Description
 ☐ Metrics
☒ Perspective
 ☒ View
 ☐ SQL

Show Columns:

☐ Metrics
☐ SQL

Package Name	Perspective	Description	View
Collection Services	Storage Allocation/Deallocation by Thread or Task	This chart shows allocation and deallocation of the temporary and permanent storage, net frames requested by thread or task. Use this chart to select a thread or task for viewing its storage statistics over time.	Storage Allocation/Deallocation by Thread or Task Sorted by Allocation
Collection Services	Storage Allocation/Deallocation Overview	This chart shows allocation and deallocation of the temporary and permanent storage for all contributors over time for the selected collections. Use this chart to select a time frame for further detailed investigation.	Storage Allocation/Deallocation Overview
Monitor	Disk Storage Utilization (Average)	Charts show the disk storage utilization (average) metric of the performance data monitored, as well as the metric breakdown details by ASP.	Disk Storage Utilization (Average)

Collection

Collection Library

QPFRDATA

Collection Name

Most Recent

Display

Search

Save as Favorite

Options

Close

Investigate Data - Performance Data Investigator**Options**

- ☐ Use patterns Use patterns where applicable in charts.
- ☒ Show charts Whenever possible, show charts instead of tables.
- ☐ Enable design mode Enable advanced features allowing design and development of new content.
- ☐ Show help Show help messages for many tasks.
- ☒ Show SQL error messages Show SQL error messages to user.
- ☐ Set table size Rows: Columns: Specify the number of visible rows and columns shown for tables.

Default library

Specify the default library that will be used when a collection is selected.

- ☒ Use Collection Services configured library
- ☐ Use last visited library
- ☐ Use library:

System Monitor

- ☐ Show thresholds Show thresholds in system monitor charts.

Design Mode

“Enable Design Mode” provides additional options to create and edit your own charts and tables.

Investigate Data - Performance Data Investigator

Perspectives

- Health Indicators
- Monitor
- Collection Services**
- Database
- Job Watcher
- Disk Watcher
- Performance Explorer
- Batch Model
- Custom Perspectives - PDITESTO

Selection

Name
Collection Services

Description
Chart and table views over a variety of performance statistics from Collection Services performance data.

Default Perspective
[Resource Utilization Overview](#)

☒ Locked

New Folder... New Perspective...

Edit Advanced Edit Delete

Move Up Move Down

Collection

Collection Library: QPFRDATA
Collection Name: Most Recent

Display Search Save as Favorite Options Refresh Perspectives Close

Additional Content Packages

- Health Indicators
 - Database
 - Job Watcher
 - Disk Watcher
 - Performance Explorer
-
- Added in 7.2:
 - Monitor
 - Batch Model



Health Indicators



Investigate Data - Performance Data Investigator

Perspectives

[Health Indicators](#)

[System Resources Health Indicators](#)

[CPU Health Indicators](#)

[Disk Health Indicators](#)

[Memory Pools Health Indicators](#)

[Response Time Health Indicators](#)

[Database Health Indicators](#)

System Resource Health Indicators

System Resources Health Indicators

Perspective Edit View History

Collection

Name(s): CS228229ND

Library: COMMON

Type: Collection Services File Based Collection

Time

Start: Feb 28, 2008 12:00:02 AM

End: Feb 29, 2008 12:00:00 AM

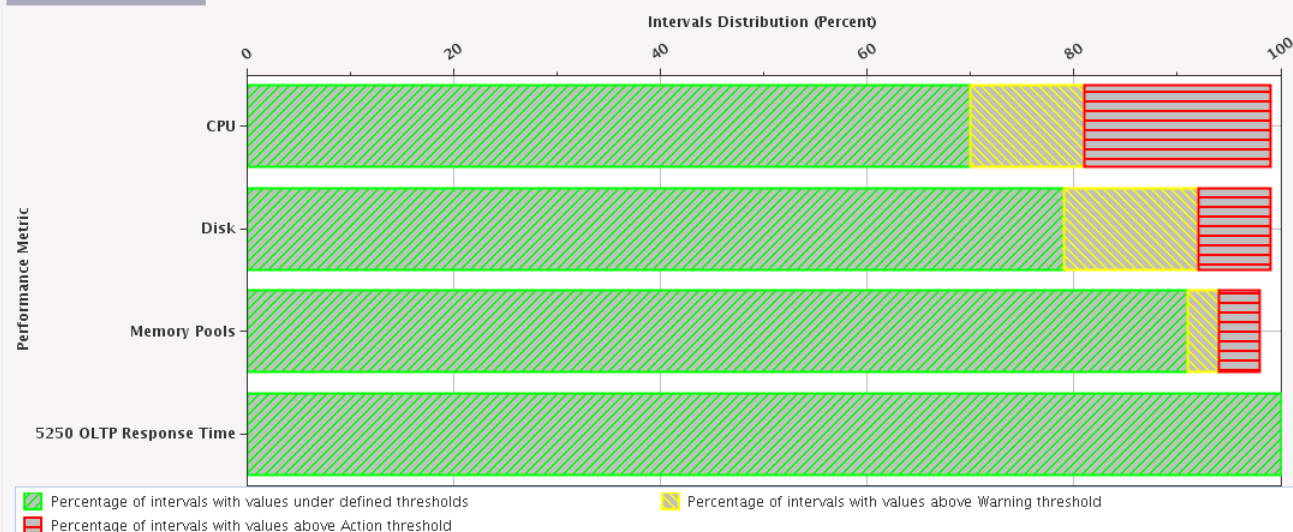
System

Name:

Release: V6R1M0

--- Select Action ---

System Resources Health Indicators



Database Health Indicators were introduced in 7.2



Define Health Indicators

- CPU Health Indicators
- Disk Health Indicators
- Memory Pools Health Indicators
- Response Time Health Indicators
- Define Health Indicators**

Define Health Indicators

System Resources Health Indicators (7.2+)	Available Indicators		Selected Indicators		Current Threshold Values	
<u>CPU</u>	[Empty]	Add >>	Jobs CPU Queuing Percent		Warning	10 Percent
Disk		Remove <<	Interactive CPU Utilization		Action	20 Percent
Memory Pools			Partition CPU Utilization			
5250 OLTP Response Time						
Database						

Define Health Indicators

System Resources Health Indicators (7.2+)	Available Indicators		Selected Indicators		Current Threshold Values	
CPU	[Empty]	Add >>	Average Disk Percent Busy		Warning	20 Percent
<u>Disk</u>		Remove <<	Average Disk Space Percent Used		Action	30 Percent
Memory Pools			Average Disk Response Time			
5250 OLTP Response Time						

Define Health Indicators

System Resources Health Indicators (7.2+)	Available Indicators		Selected Indicators		Current Threshold Values	
CPU	[Empty]	Add >>	Plans Built/Rebuilt Rate		Warning	20 Rate Per Second
Disk		Remove <<	Native Full Opens Rate			
Memory Pools			SQL Full Opens Rate			
5250 OLTP Response Time			Physical Database I/O Rate			
<u>Database</u>			Plans Removed from Cache Rate		Action	50 Rate Per Second

Performance Data Reports

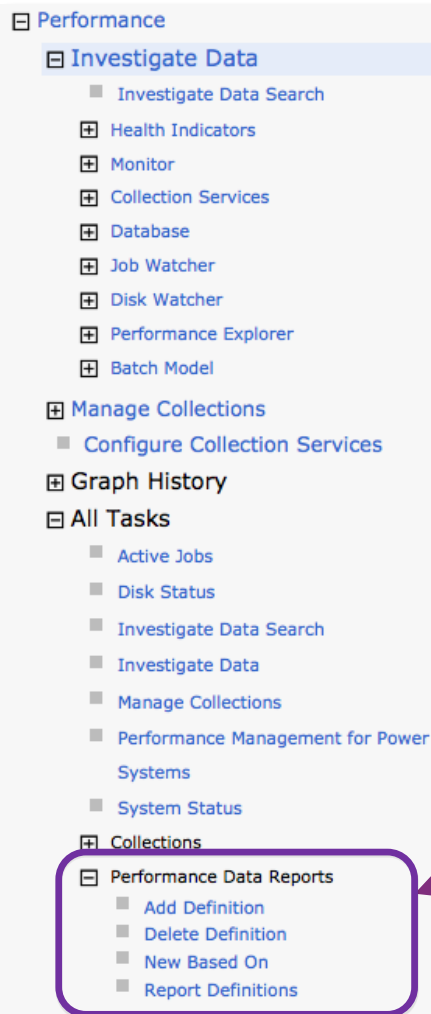
“Executive” Reports



- Create a group of printed or online graphs of performance perspectives.
- Generate a PDF or zip file containing the requested graphs for the collection
- Use for weekly reports

Create Performance Data Report

Start here with Report Definitions



Report Definitions

- ☐ Performance Data Reports
 - Add Definition
 - Delete Definition
 - New Based On
 - Report Definitions

Performance Data Report Definitions - Etc3t1.rchland.ibm.com




 Actions ▾



☐	Name	Description
 ...	No filter applied ✕	
☐	Health Indicators	A predefined performance
☐	System Overview	A predefined performance
☐	Resource Consumption	A predefined performance

Create Performance Data Report

Report definition:

Output type:

Collection:

Library:

Type:

Create your own Report Definition

Add Performance Data Report Definition

Add Performance Data Report Definition

Name:

Description:

Perspectives

Select	Perspective	Package
☐	None	

Collection

Collection: Most Recent

Library: QPFRDATA

Type:

Cover Page

Title:

☒ Report definition name

☒ Date created

☒ Perspectives

☒ Collection name

Performance Data Report Definitions - Etc3t1.rchland.ibm.com

Actions

- New
 - Add Performance Data Report Definition...
- Refresh
- Advanced Filter
- Export
- Configure Options

Name	Description
No filter applied	
Health Indicators	A predefined performance
System Overview	A predefined performance
Resource Consumption	A predefined performance

Add Performance Data Report Definition

Add Perspective

Filter

Collection name: CS228229ND (*CSFILE)

Library: COMMON

Perspectives

- Database
- Collection Services
 - CPU Utilization and Waits Overview
 - Resource Utilization Overview
- Job Statistics Overviews
- Waits
- CPU
- Disk
- Physical Disk I/O
- Synchronous Disk I/O

Add Performance Data Report Definition

Add Performance Data Report Definition

Name: Demo Report

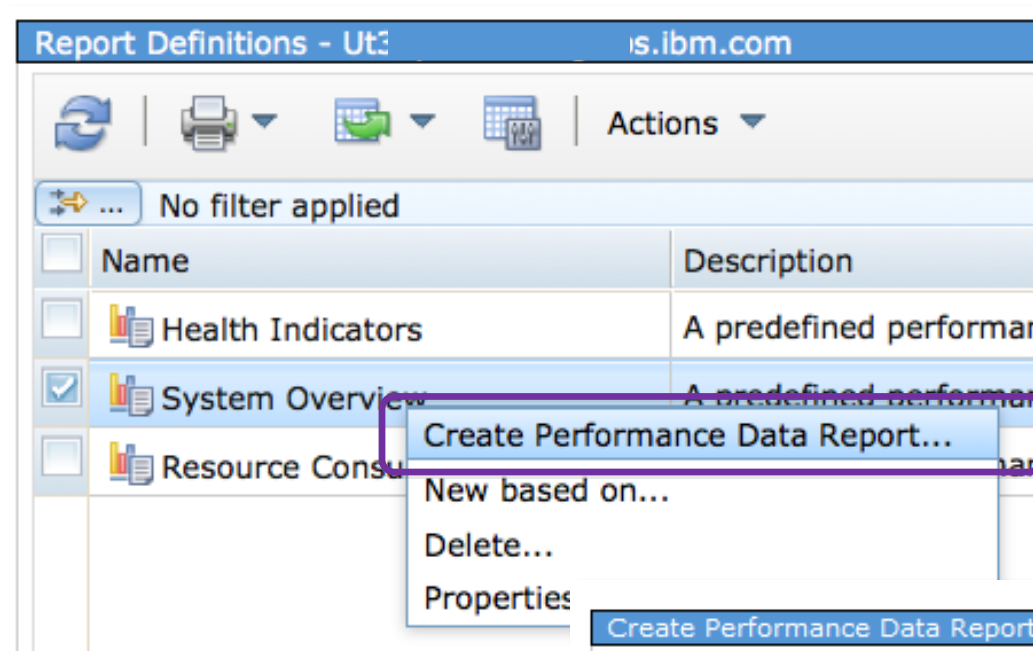
Description: Report prepared for my presentation

Perspectives

--- Select Action ---

Select	Perspective	Package
☐	CPU Utilization and Waits Overview	Collection Services
☐	Page Faults Overview	Collection Services
☐	Synchronous Disk I/O Overview	Collection Services

Create Performance Data Report



Create Performance Data Report

Report definition: Demo Report

Output type: PDF

Collection: CS228229ND (*CSFILE) - Feb 28, 2008 12:00:02 AM

Library: COMMON

Type: Collection Services File Based Collection

OK Cancel

Resulting Report (PDF example)

Feb 28, 2013 10:03:43 AM

Performance data report definition:

Demo Report

Report title:

Example Report based upon COMMON performance collection

Perspectives included in report:

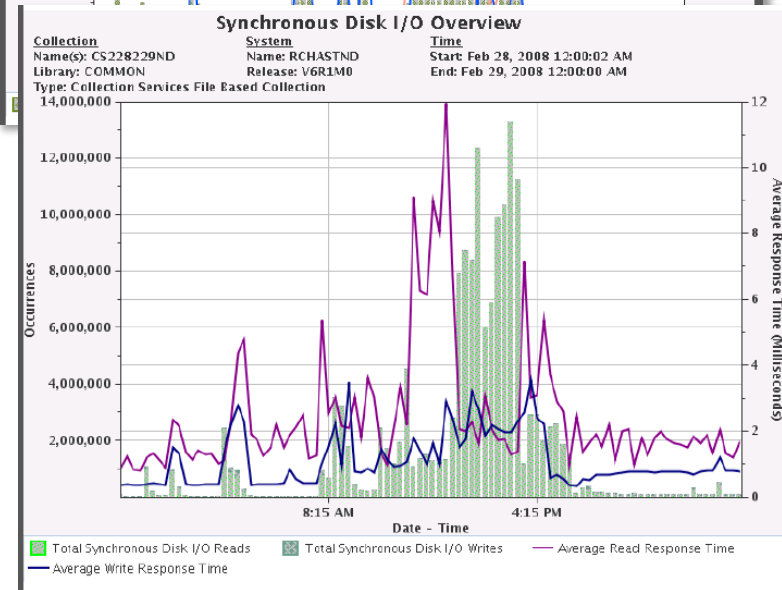
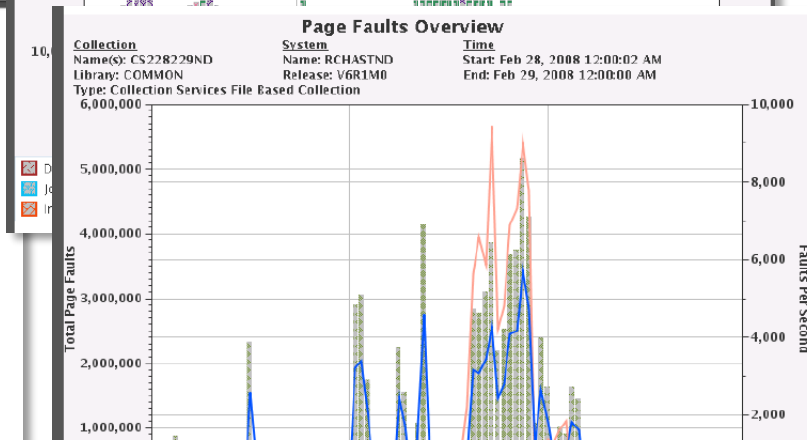
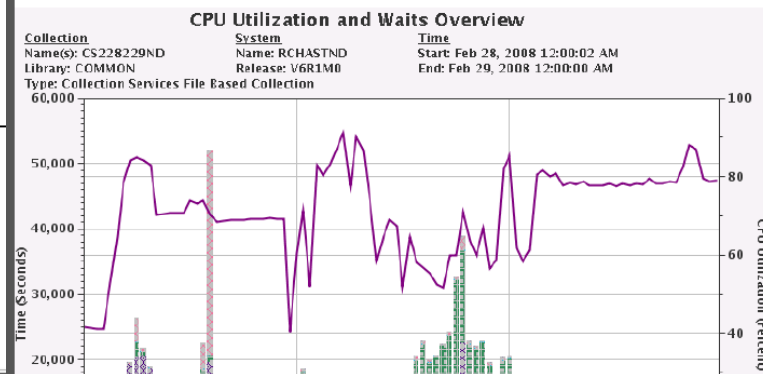
CPU Utilization and Waits Overview

Page Faults Overview

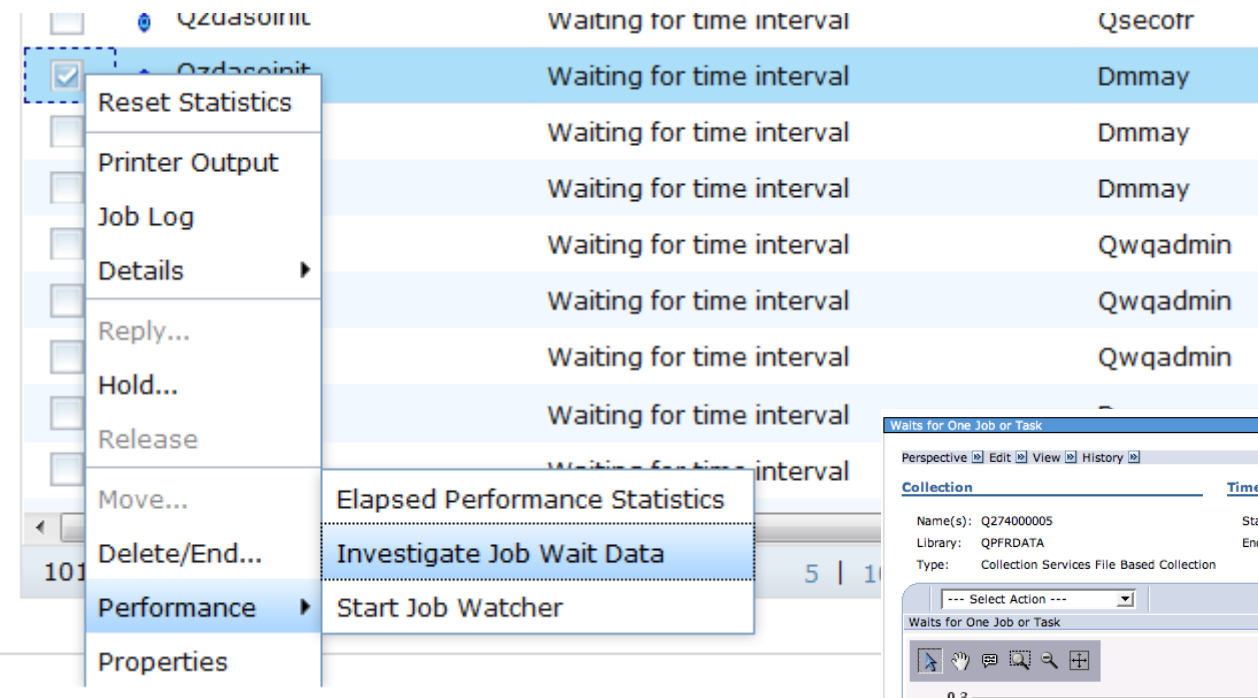
Synchronous Disk I/O Overview

Library/Collection used for report:

Common/Cs228229nd

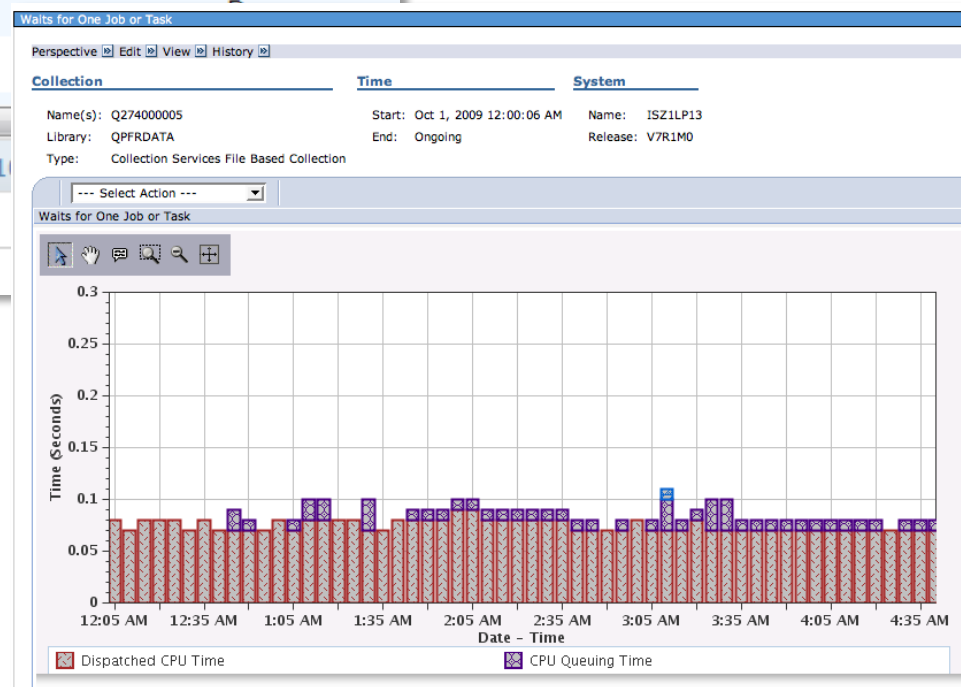


Integration with Active Jobs



Active jobs – what's happening *right now*

Collection Services data with your wait data – what happened *up to now*



Integration with System Status



System Status - €

Last refresh: 3/8/13 12:46:53 PM

General

Jobs

Processors

Memory

Disk Space

Addresses

Jobs

Total: 4,537

Active: 262

Addresses used

Permanent: 0.010 %

Temporary: 0.022 %

Total disk space: 95.44 GB

System disk pool

Capacity: 95.44 GB

Usage: 79.118 %

System Resources Health Indicators

System Status - €

Last refresh: 3/8/13 12:46:53 PM

General

Jobs

Processors

Memory

Disk Space

Addresses

Total memory: 4,096.00 MB

Active Memory Pools

Memory Pools Health Indicators

System Status

Last refresh: 3/8/13 12:46:53 PM

General

Jobs

Processors

Memory

Disk Space

Addresses

CPU usage (elapsed): 0.0 %

Type of processors: Shared - uncapped

Processing power: 0.20 processing units

Virtual processors: 2

Interactive performance: 0 %

Shared processor pool usage (elapsed): 0.0 %

Uncapped CPU capacity pool usage (elapsed): 0.0 %

CPU Health Indicators

System Status - €

Last refresh: 3/8/13 12:46:53 PM

General

Jobs

Processors

Memory

Disk Space

Addresses

Total disk space: 95.44 GB

System disk pool

Capacity: 95.44 GB

Usage: 79.118 %

Temporary storage used

Current: 8,407 MB

Maximum since last system restart: 8,435 MB

Disk Status

Storage System Values

Disk Health Indicators

Disk Status - Z:

Refresh Elapsed time: 00:00:00

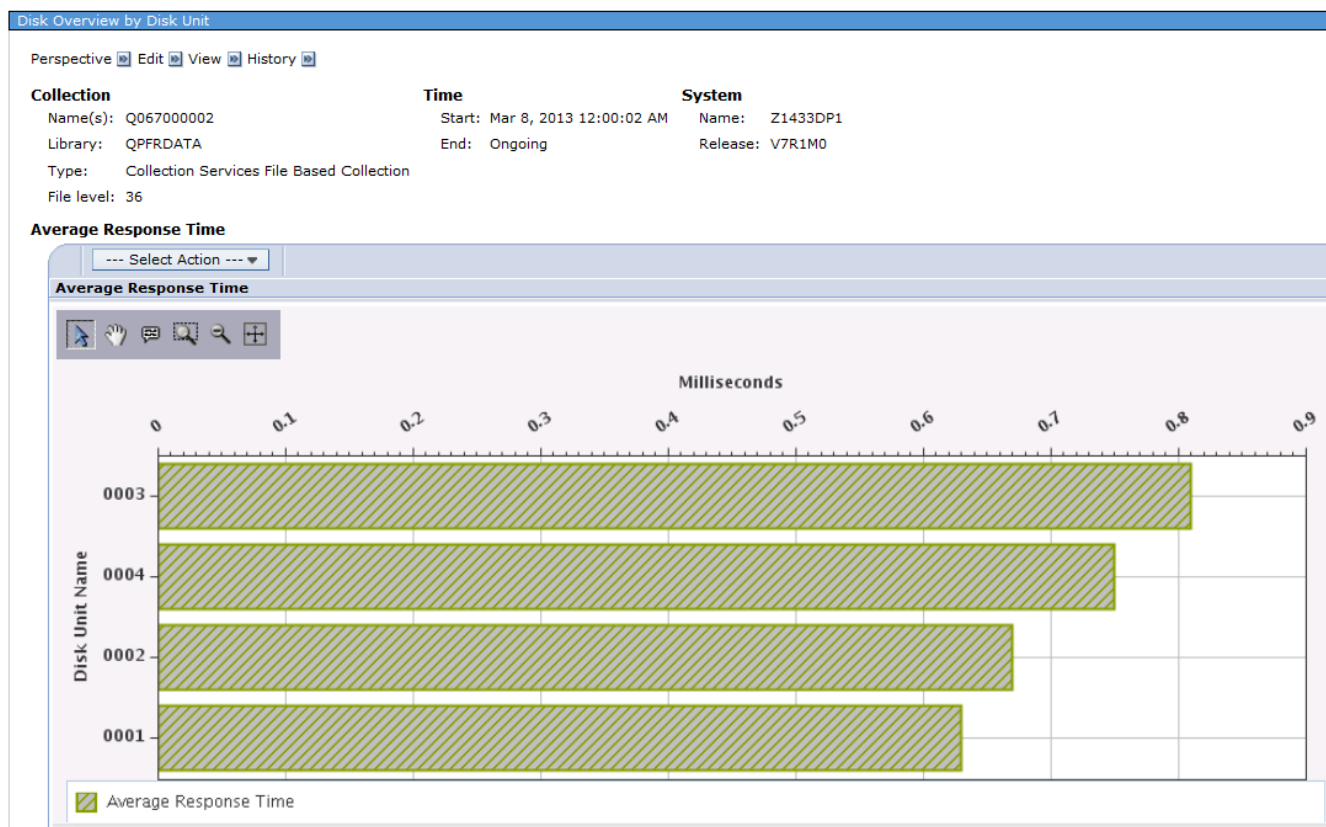
Actions

- Investigate Disk Data
- Start Disk Watcher
- Reset Statistics
- Columns...
- Refresh
- Advanced
- Export
- Configure

Unit	Size (MB)	% Used	% Busy
69.794	75.7	0	

No filter applied

1 2 3 4



Set Target System

IBM i Management

Target Systems and Groups

Target Systems

System Groups

7.2 screen captures

You can connect to one partition, but manage a different partition.

You can manage IBM i 5.4, 6.1, 7.1, 7.2, & 7.3

Not all features are available on all releases

Target Systems

[Add Target System](#)[Set As Target System](#)[Properties](#)[Delete](#)[Refresh System Status](#)

	System Name	Release	User	System Description
 ...	No filter applied			
	 Etc3t2.rchland.ibm.com	v7r2m0	Dmmay	
	 Etc3t1.rchland.ibm.com	v7r1m0	Dmmay	
	 Ctcweb54.rchland.ibm.com	v5r4m0	Dmmay	
	 Itcgen3.rchland.ibm.com	v7r1m0	Dmmay	
	 Isz1lp11.rch.stglabs.ibm.com	v6r1m0	Dmmay	IBM i 6.1

Investigate Data Database

Requires the latest PTF groups, including the database group
Must have the Performance Tools LPP, Manager feature, installed

Available on IBM i 7.1 with PTFs
Included with IBM i 7.2 and later



Integration with Database

- Leverage the capabilities of PDI with valuable data gathered from database
- PDI charting of
 - SQL Plan Cache Snapshots and Event Monitors
 - SQL Performance Monitor files
- Collection Services collection of job-level SQL metrics
- Visual charts and/or tables in PDI that are focused on database related metrics
- Navigation between database and performance tasks

Database Perspectives

[-] Performance

[-] Investigate Data

- Investigate Data Search

- [+] Health Indicators

- [+] Monitor

- [+] Collection Services

- [+] Database

- [+] Job Watcher

- [+] Disk Watcher

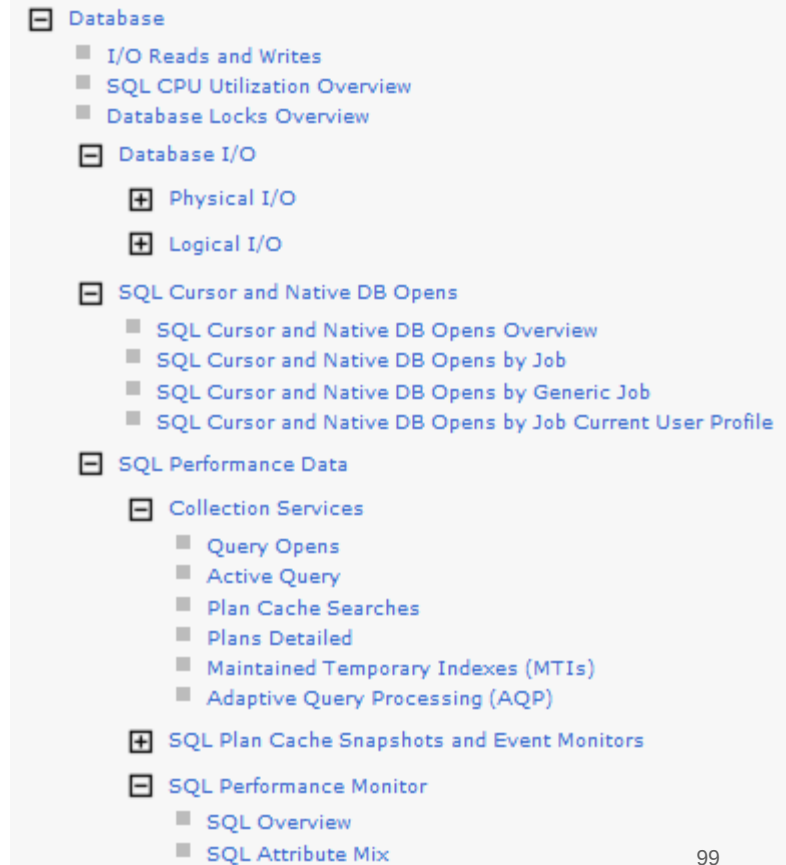
- [+] Performance Explorer

- [+] Batch Model

Must have the Performance Tools LPP, Manager Feature, installed

Integration with Database – package overview

- Database Package for 7.1 and later
 - I/O Reads and Writes
 - SQL CPU
 - Database Locks Overview
 - Database I/O
 - Utilizes Job Level SQL Metrics
 - SQL Cursor and Native DB Opens
 - SQL Performance Data
 - SQL Plan Cache Snapshots and
 - Event Monitors
 - SQL Performance Monitor



Integration with Database

Launch “Investigate Performance Data” from various database tasks

The image displays three screenshots of the IBM Performance Center interface, demonstrating how to launch the "Investigate Performance Data" task from various database tasks.

Top Left Screenshot: SQL Performance Monitors - Z1433dp1

Database: Zh22dp1

Name	Type	Status
No filter applied		
amonitor2	Detailed	Ended
amonitor3	Detailed	Ended
as		Imported
asmalltest		
asum		

Context menu for "amonitor3":

- End
- Analyze...
- Investigate Performance Data...

Top Right Screenshot: SQL Plan Cache Event Monitors - Z1433dp1

Database: Zh22dp1

Name	Status	Schema
No filter applied		
myeventmon1	Ended	FLANAGAN
SQL Plan Cache Event		PDITESTLIB
SQL Plan Cache PDI		ZZLIB

Context menu for "SQL Plan Cache Event":

- End
- Analyze...
- Investigate Performance Data...

Bottom Screenshot: SQL Plan Cache Snapshots - Z1433dp1

Database: Zh22dp1

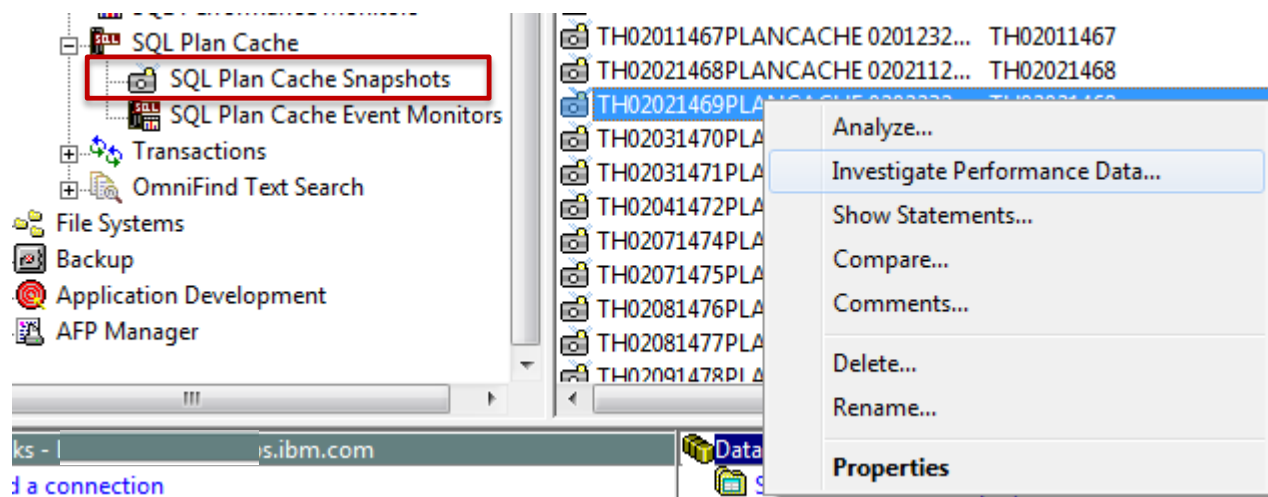
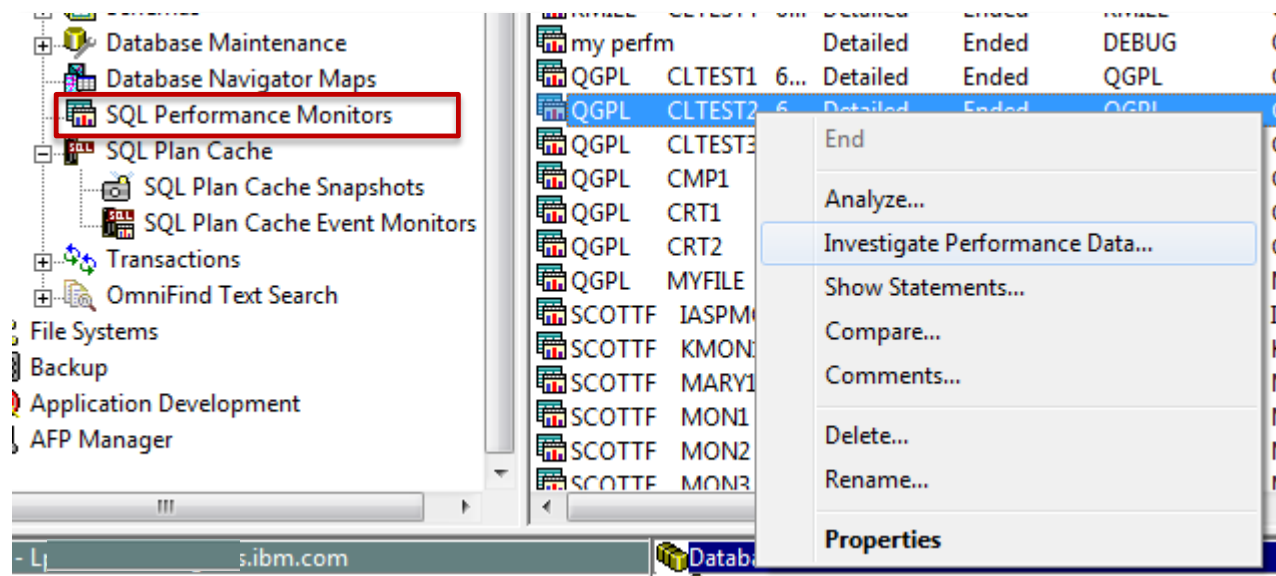
Name	Schema
No filter applied	
asmalltest2	QGPL
kxkSnapshot	ZZLIB
lrp1	LRP
my snap1	

Context menu for "kxkSnapshot":

- Analyze...
- Investigate Performance Data...

Launch PDI from System i Navigator client

7.1 examples



SQL Overview

Several graphs:

- Query time summary
- Open summary
- Open type summary
- Statement usage summary
- Index used summary
- Index create summary
- Index advised
- Statistics advised
- MQT use
- Access plan use
- Parallel degree usage

Investigate Data - Performance Data Investigator

Perspectives

- Performance Explorer
- Disk Watcher
- Job Watcher
- Health Indicators
- Collection Services
- Database
 - Database I/O
 - SQL Performance Data
 - SQL Plan Cache
 - SQL Overview**
 - SQL Attribute Mix
 - SQL Performance Monitor

Selection

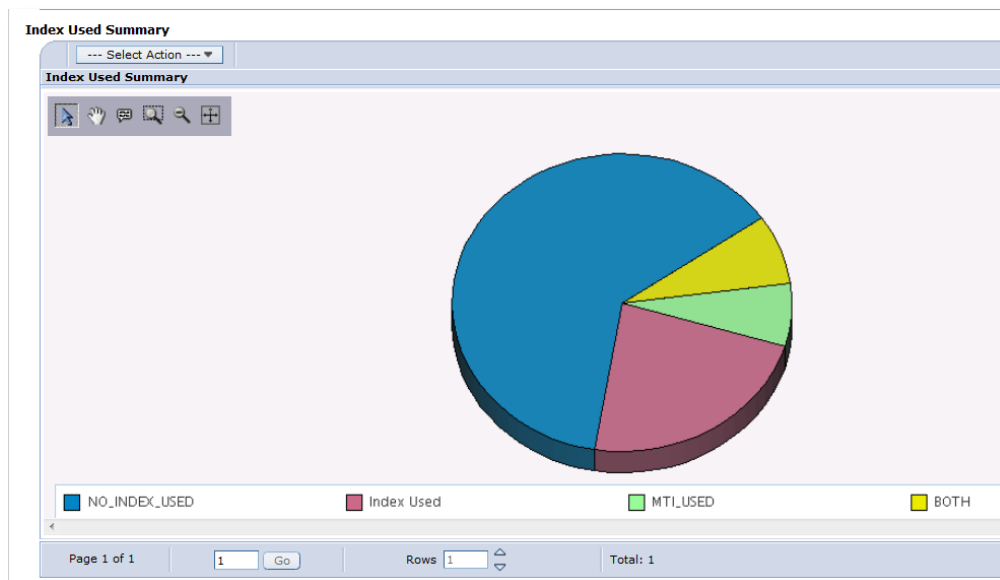
Name
SQL Overview

Description
This perspective gives a comprehensive picture of how queries are running overall.

Collection

Collection Library: DMMLIB Collection Name: Plan Cache Snapshot for PDI (SQL Plan Cache Snapshot)

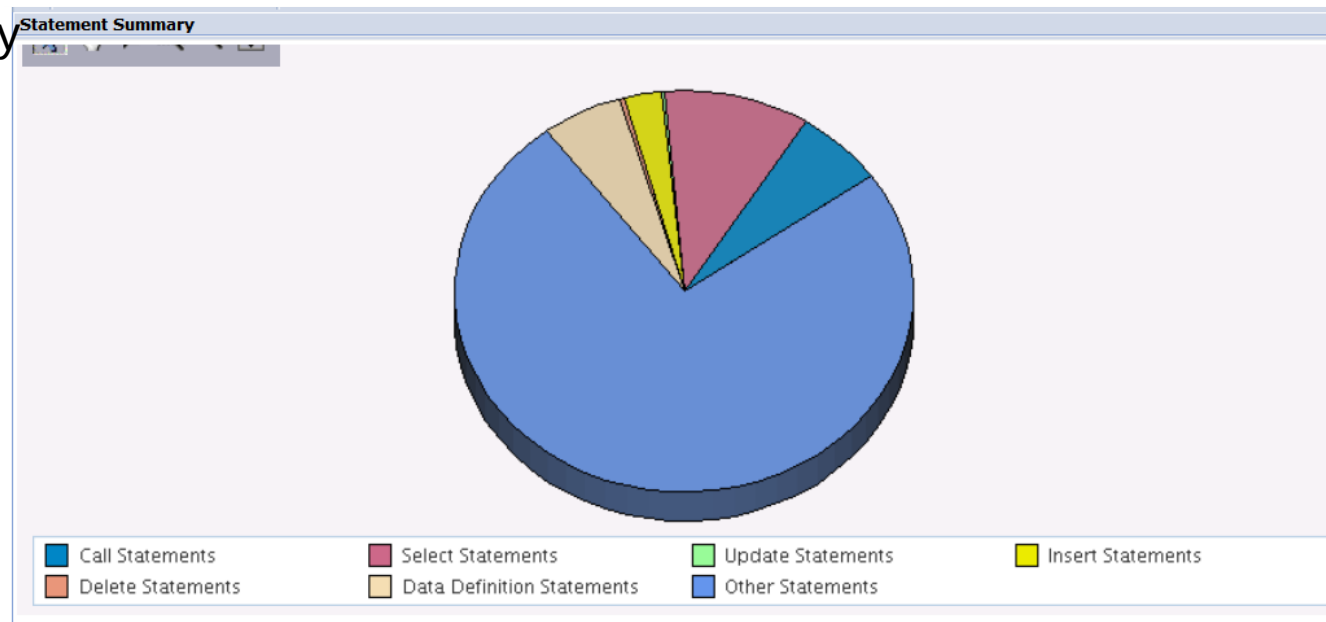
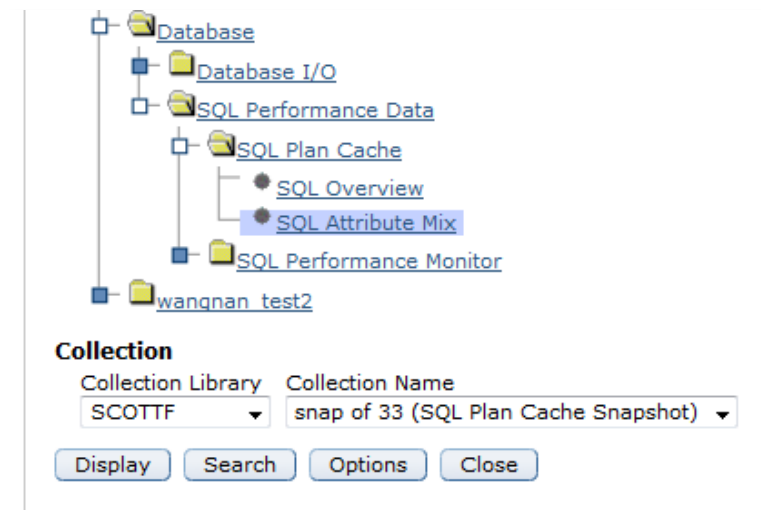
Display Search Options Close



SQL Attribute Mix

Several graphs:

- Statement summary
- Statement type summary
- Isolation level summary
- Allow copy data summary
- Sort sequence summary
- Close cursor summary
- Naming summary
- Optimization goal
- Blocking summary



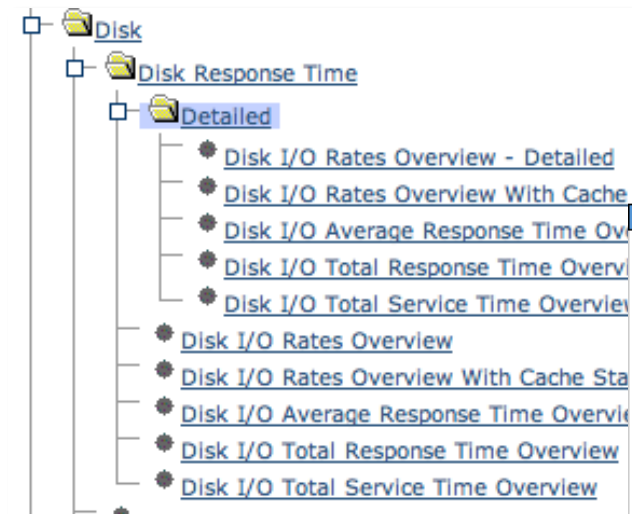
Investigate Data

Favorite

Collection Services Perspectives

(PDI is more than Performance)

Disk Response Time Charts



A very easy interface to see if you have slow disk operations

Disk I/O Rates Overview - Detailed

Perspective Edit View History

Collection

Name(s): DISKRSPCOL

Library: COMMON

Type: Collection Services File Based Collection

Time

Start: Mar 11, 2008 12:31:19 PM

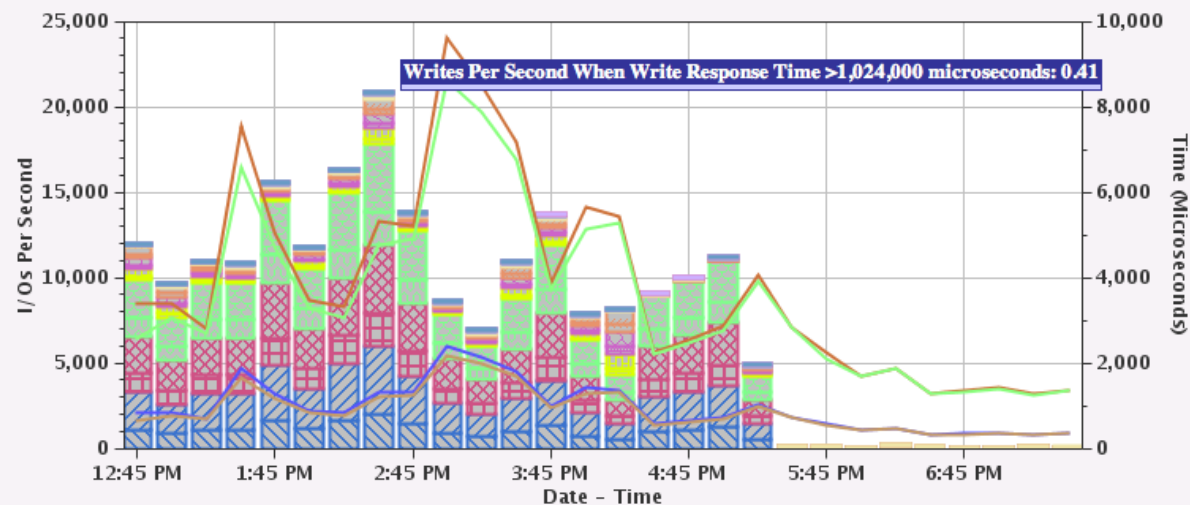
End: Mar 11, 2008 7:30:00 PM

System

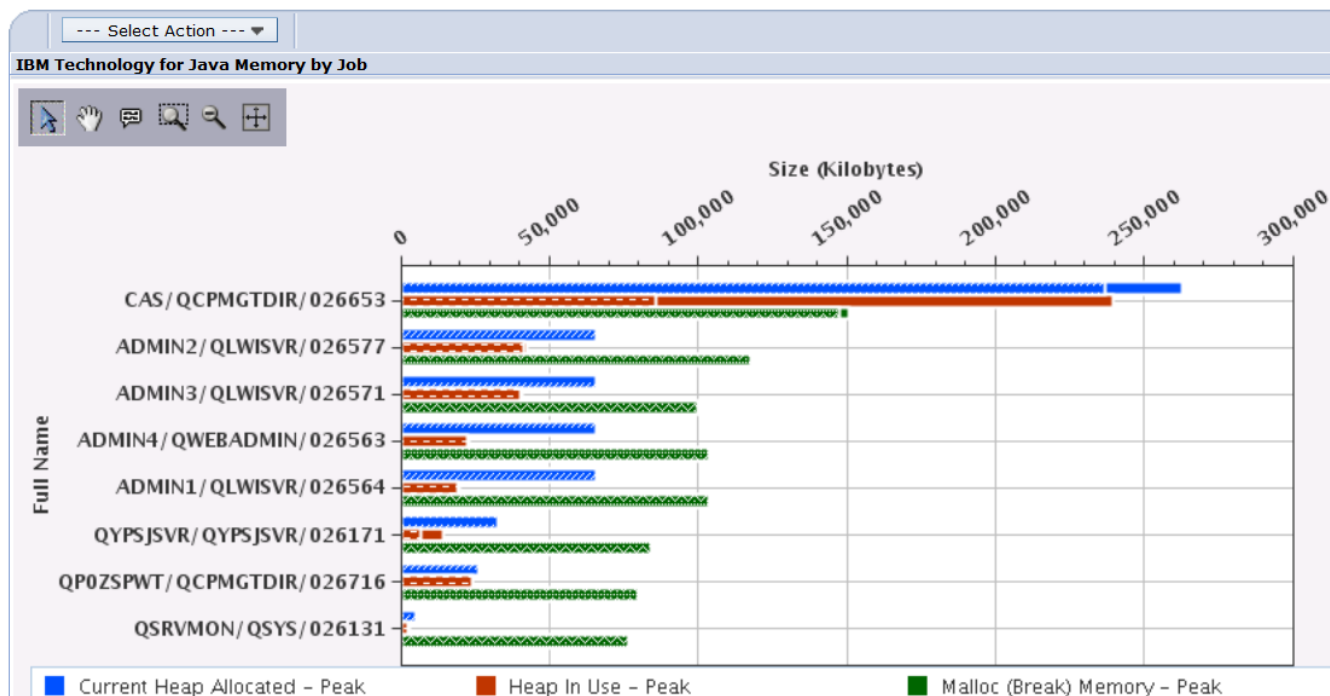
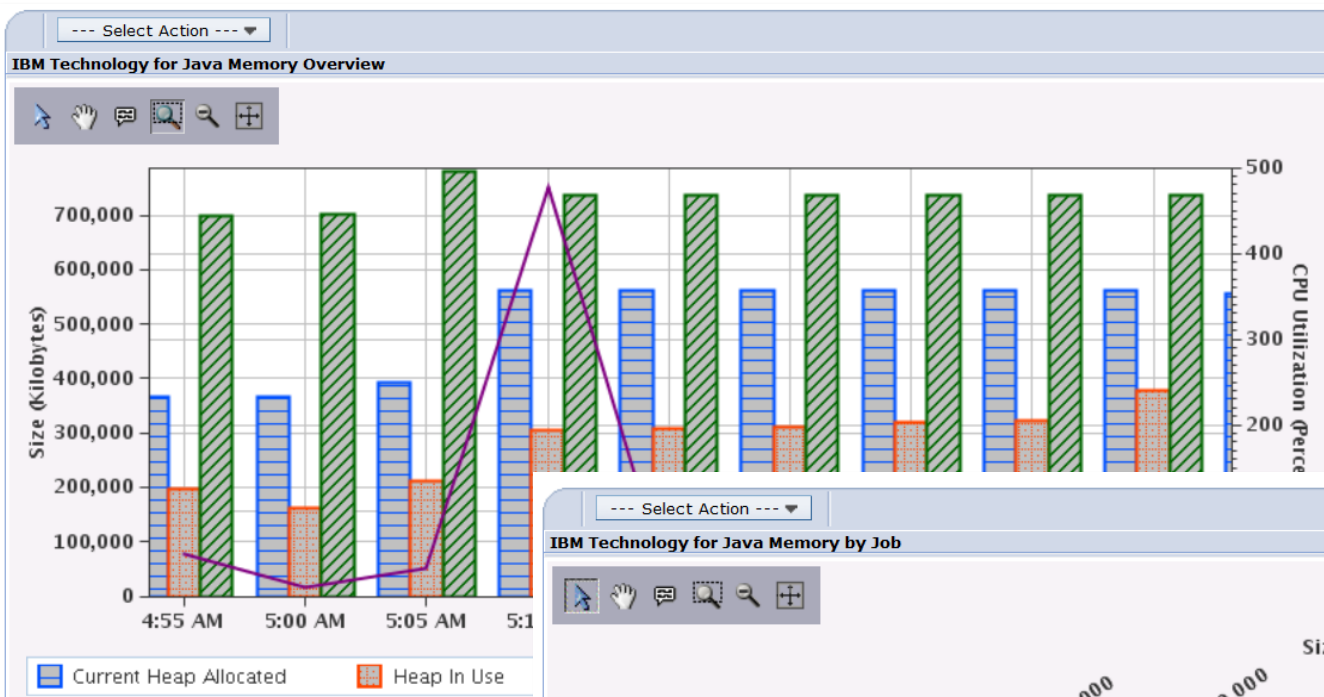
Name:

Release: V6R1M0

--- Select Action ---

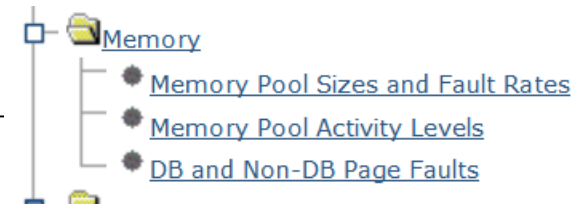


Java Perspectives



Find that job using a lot of heap...

Memory



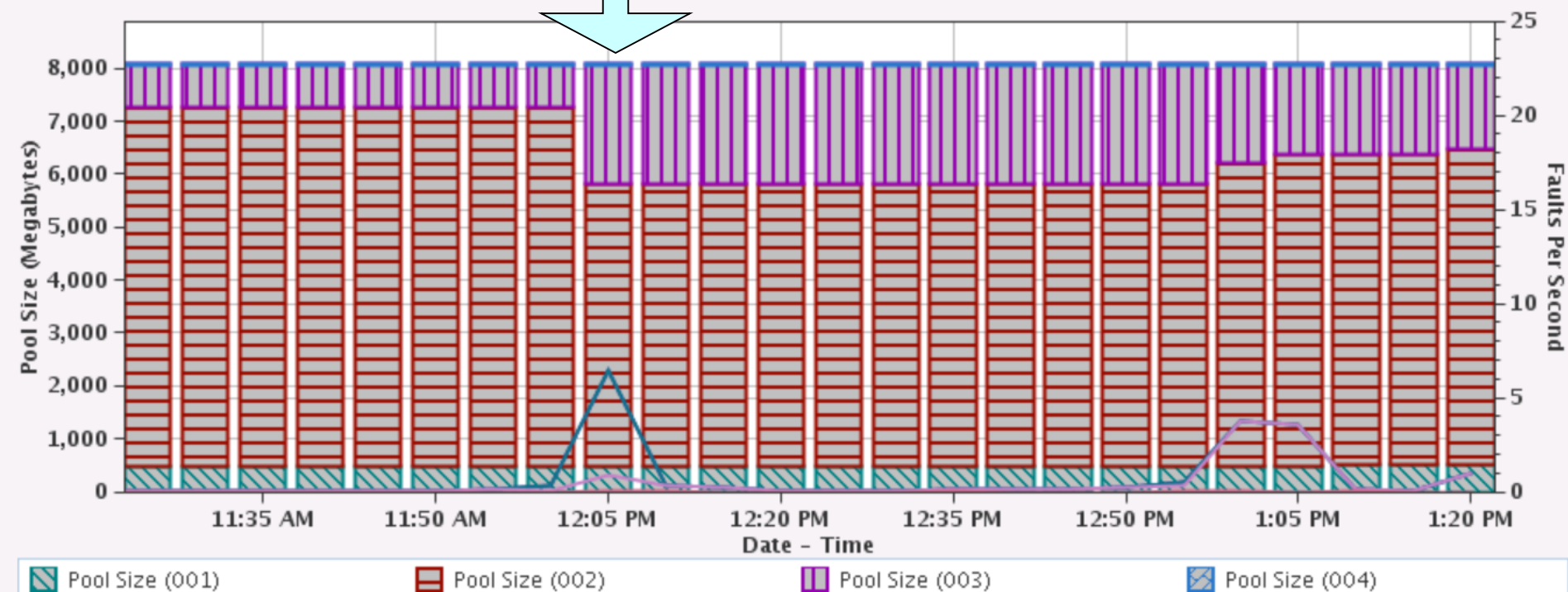
- Memory perspectives are now available
- Similar information from what you get on WRKSYSSTS....

System Pool	Pool Size (M)	Reserved Size (M)	Max Active	-----DB-----		---Non-DB---	
				Fault	Pages	Fault	Pages
1	<u>490.59</u>	247.83	+++++	.0	.0	.0	.0
2	<u>5344.71</u>	6.07	<u>149</u>	.0	.0	.0	.0
3	<u>2283.44</u>	.00	<u>203</u>	.0	.0	12.3	29.0
4	<u>.25</u>	.00	<u>5</u>	.0	.0	.0	.0

In a graphical view!

Note the change in pool sizes.
QPFRADJ is on.

Memory Pool Sizes and Fault Rates



Storage Allocation Perspectives



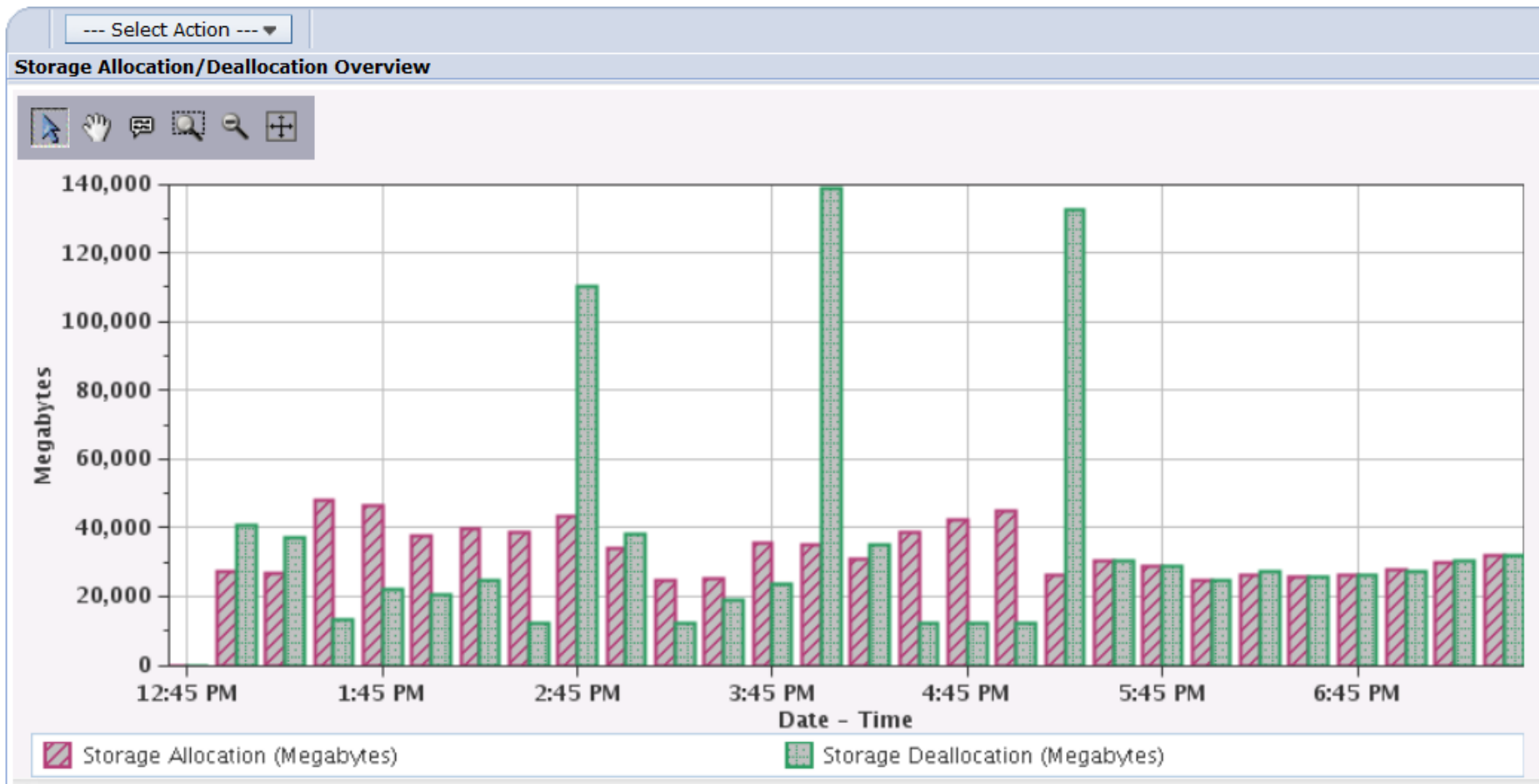
Selection

Name

Storage Allocation/Deallocation Overview

Description

This chart shows allocation and deallocation of the temporary and permanent storage for all contributors over time for the selected collections. Use this chart to select a time frame for further detailed investigation.



Storage Allocation by Thread or Task



Selection

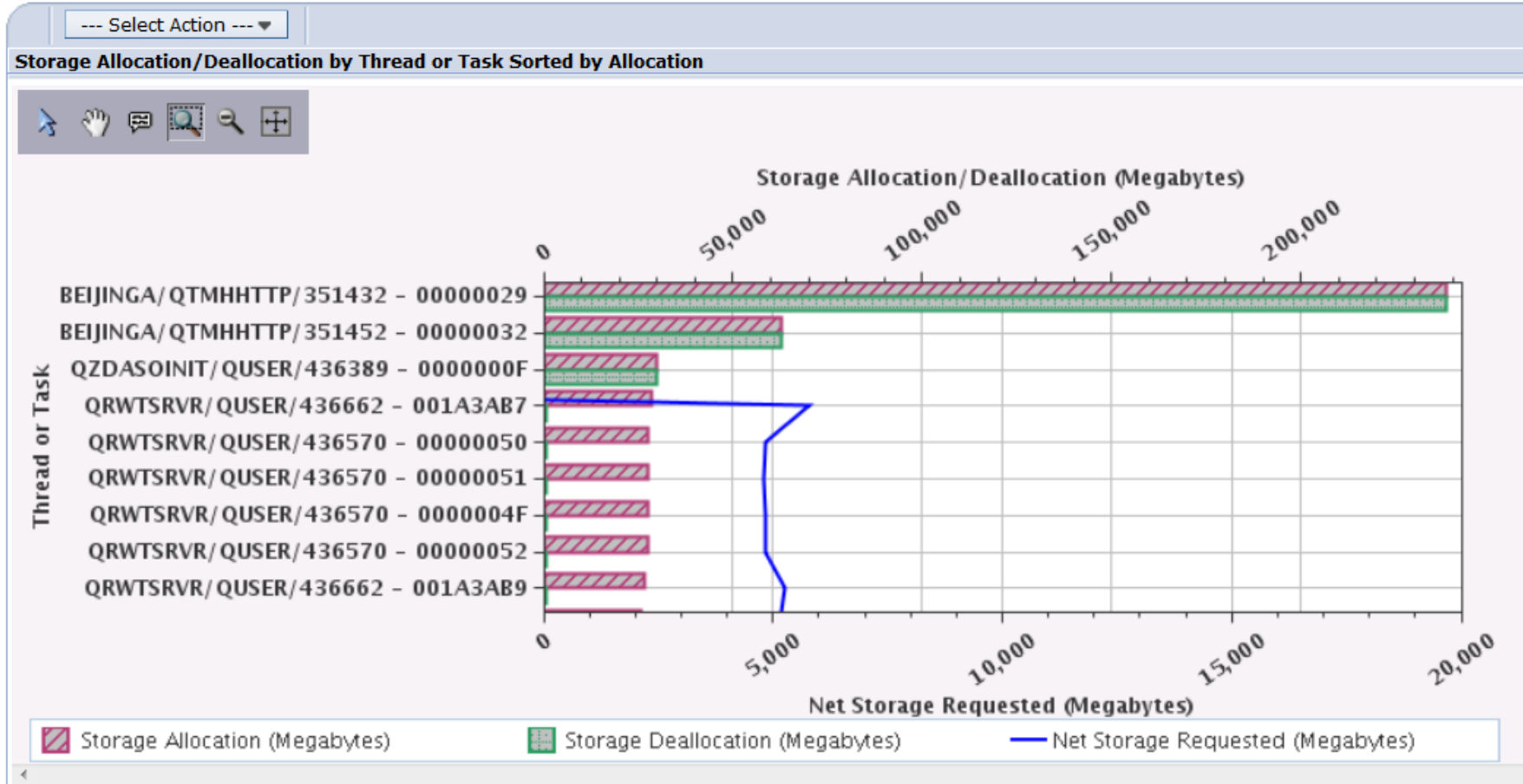
Name

Storage Allocation/Deallocation by Thread or Task

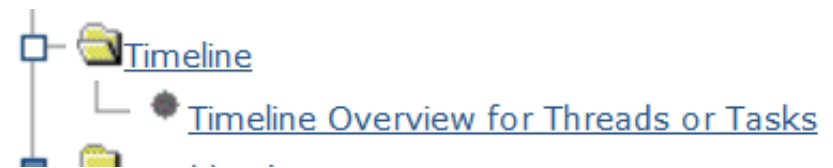
Description

This chart shows allocation and deallocation of the temporary and permanent storage, net frames requested by thread or task. Use this chart to select a thread or task for viewing its storage statistics over time.

Storage Allocation/Deallocation by Thread or Task Sorted by Allocation



Timeline Perspective



The timeline bars on the chart represent the elapsed time of threads or tasks

- Dispatched CPU Time
- CPU Queuing Time
- Other Waits Time

Selection

Name

Timeline Overview for Threads or Tasks

Description

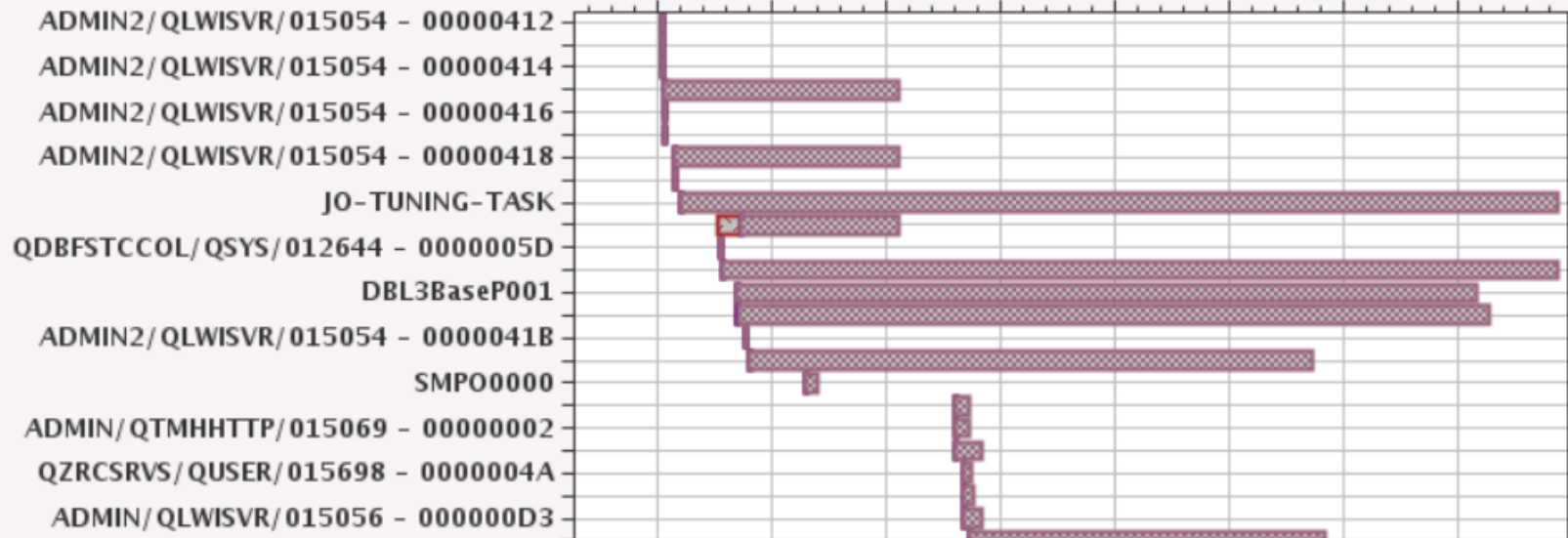
This chart shows the timeline overview for threads or tasks. Use this chart to select a thread or task for viewing its detailed run and wait contributions.

Timeline Overview for Threads or Tasks



Date - Time (Apr 14, 2008 4:15:15 PM ~ Apr 14, 2008 5:34:00 PM)
4/14/08 4:28:20 PM 4/14/08 4:45:00 PM 4/14/08 5:01:40 PM 4/14/08 5:18:20 PM

Thread or Task



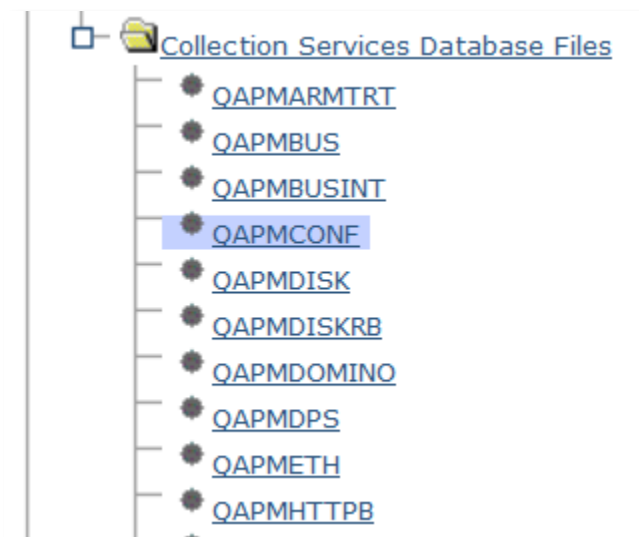
Dispatched CPU Time

CPU Queuing Time

Other Waits Time

Display Collection Services DB Files

.... QAPMCONF



QAPMCONF

Perspective  Edit  View  History 

Collection	Time	System
Name(s): Q067000002	Start: Mar 8, 2013 12:00:02 AM	Name: ETC3T1
Library: QPFRDATA	End: Ongoing	Release: V7R1M0
Type: Collection Services File Based Collection		
File level: 36		

QAPMCONF Panel View

Library Name:	QPFRDATA	Processor Firmware Time:	No
Member Name:	Q067000002	Task Threshold Value (ms):	1,000
Start Time:	Mar 8, 2013 12:00:02 AM	Secondary Thread Thresh (ms):	1,000
Model Number:	61X	Disk Response Time Boundary 1 (us):	15
System Type:	7998	Disk Response Time Boundary 2 (us):	250
Partition Memory (KB):	4194304	Disk Response Time Boundary 3 (us):	1,000
Comm Data Collected:	Y	Disk Response Time Boundary 4 (us):	4,000
Machine Serial Number:	10-065FA	Disk Response Time Boundary 5 (us):	8,000
Response Time Boundary 1 (ms):	1000	Disk Response Time Boundary 6 (us):	16,000
Response Time Boundary 2 (ms):	2000	Disk Response Time Boundary 7 (us):	64,000
Response Time Boundary 3 (ms):	4000	Disk Response Time Boundary 8 (us):	256,000
Response Time Boundary 4 (ms):	8000	Disk Response Time Boundary 9 (us):	500,000
System ASP Capacity (KB):	93,206,752	Disk Response Time Boundary 10 (us):	1,024,000
Checksum Protection On:	N	Hypervisor Memory (MB):	640
Virtual Processors:	2	SMT Hardware Threads:	0
Installed Processors:	4	Time Interval (minutes):	5
Remote Response Boundary 1 (ms):	-	Interactive Limit (%):	100.00
Remote Response Boundary 2 (ms):	-	Time Interval (seconds):	300
Remote Response Boundary 3 (ms):	-	Interactive Threshold (%):	100.00
System ASP Capacity (KB):	93,206,752	Processor Multi-tasking Capability:	System Controlled
Perm 16MB Addr Remaining:	274,848,547,584	Output File System:	ETC3T1
Temp 16MB Addr Remaining:	274,814,995,200	Partition Count:	3
Disk Resp Time Boundary 1 (ms):	1	Processor Folding Support:	No
Disk Resp Time Boundary 2 (ms):	16	Partition ID:	2
Disk Resp Time Boundary 3 (ms):	64	Primary Partition ID:	0
Disk Resp Time Boundary 4 (ms):	256	Processor Units:	0.2
Disk Resp Time Boundary 5 (ms):	1,024	System Version:	7
Collection Data:	Consistent with *SYS	System Release:	1.0
Collect Internal Data:	N	System Name:	ETC3T1
*CSMGTCOL Collection Library:	QPFRDATA	Performance Monitor Select Job:	
*CSMGTCOL Collection Name:	Q067000002	Shared Processor Pool:	Yes
Database Consistency:		Partition Sharing Capped:	Uncapped
Database Limit (% of CPU):	100.0	Variable Processor Speed Capability:	1
		QPFRADJ System Value:	2

Manage Collections

- The Manager Collections tasks allows you to see and manage all of your performance data from one central location
- Various tasks can be launched from the **Manage Collections** task, including the Performance Data Investigator

Manage Collections - Ut bs.ibm.com

Search

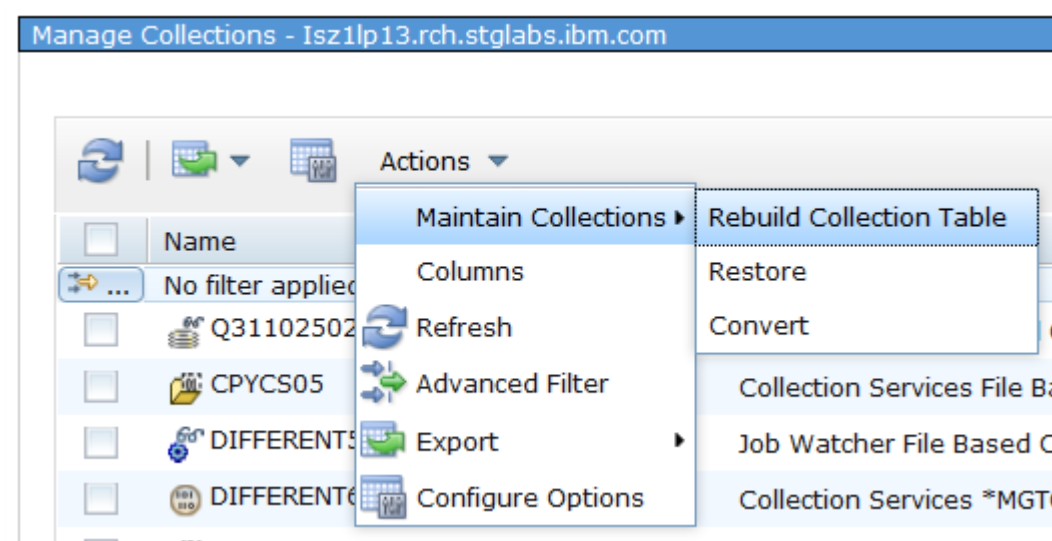
No filter applied

Name	Library	Type	Status	Started	Ended	Size MB	System	Version
Q095000003	QPFRRDATA	Collection Services *MGTCOL Obj Based Col	Complete	4/4/16 12:00:03 AM	4/5/16 12:00:04 AM	2,682.13	UT30902	V7R3M0
Q111000004	QPFRRDATA	Collection Services *MGTCOL Obj Based Col	Complete	4/20/16 12:00:05 AM	4/21/16 12:00:04 AM	2,533.63	UT30902	V7R3M0
Q096000004	QPFRRDATA	Collection Services *MGTCOL Obj Based Col	Complete	4/5/16 12:00:04 AM	4/6/16 12:00:03 AM	2,682.13	UT30902	V7R3M0
Q097000003	QPFRRDATA	Collection Services *MGTCOL Obj Based Col	Complete	4/6/16 12:00:03 AM	4/7/16 12:00:04 AM	2,698.13	UT30902	V7R3M0
Q107000004	QPFRRDATA	Collection Services File Based Collection	Complete	4/16/16 12:00:04 AM	4/17/16 12:00:00 AM	372.953	UT30902	V7R3M0
Q1080	QPFRRDATA	Collection Services File Based Collection	Complete	4/17/16 12:00:04 AM	4/18/16 12:00:00 AM	377.371	UT30902	V7R3M0
Q1090	QPFRRDATA	Collection Services File Based Collection	Incomplete	4/18/16 12:00:03 AM		212.527	UT30902	V7R3M0
Q1100	QPFRRDATA	Collection Services File Based Collection	Incomplete	4/19/16 12:00:04 AM		14.078	UT30902	V7R3M0
Q0980	QPFRRDATA	Collection Services *MGTCOL Obj Based Col	Complete	4/7/16 12:00:05 AM	4/8/16 12:00:03 AM	2,616.63	UT30902	V7R3M0
Q1110	QPFRRDATA	Collection Services File Based Collection	Complete	4/20/16 12:00:05 AM	4/21/16 12:00:00 AM	361.031	UT30902	V7R3M0
Q112114721	QPFRRDATA	Collection Services *MGTCOL Obj Based Col	Complete	4/21/16 11:47:21 AM	4/22/16 12:00:04 AM	889.386	UT30902	V7R3M0
Q099000003	QPFRRDATA	Collection Services *MGTCOL Obj Based Col	Complete	4/8/16 12:00:03 AM	4/9/16 12:00:04 AM	2,581.63	UT30902	V7R3M0

Create Batch Model
Move
Copy
Delete
Save
Investigate Performance Data
Properties

Manage Collections

- If you restore performance data without using the Restore Performance Collection interface, collections may not display in the Manage Collections view.
- The “Rebuild Collection Table” option will rebuild the meta-data used for the Manage Collections task and then your performance data should be visible.



Performance Data - Analysis

Performance Diagnostics with the Performance Data Investigator





Analyzing Performance Data Using PDI

- Now that you know all that PDI can do....
 - How do you really use it to analyze performance data?
 - There are no specific steps – it all depends upon what you see in the performance data
 - If you look at your performance data on a regular basis, you will learn your “normal” pattern which makes it easier to identify something unusual
 - Experience is the best teacher

Analyzing Performance Data Using PDI

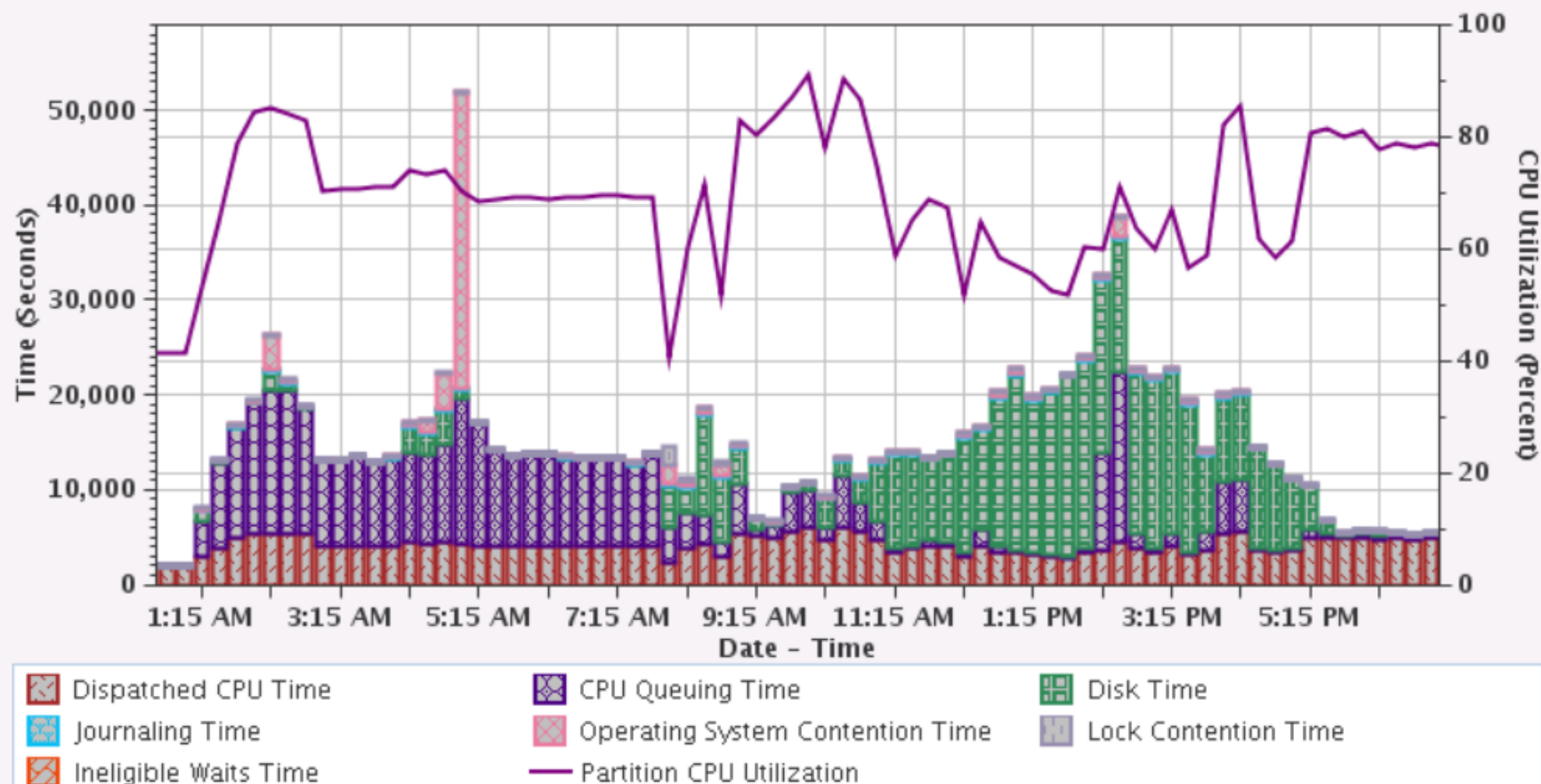
- Start by asking questions:
 - What was the symptom of the problem?
 - Who reported the problem
 - What time did it occur?
 - How long did it last?
- Have there been any recent changes?
 - New or changed workload?
 - Any application changes?
 - Any recent hardware configuration changes?
- What was the scope?
 - Did it impact the entire system?
 - Did it impact some subset of work?
 - Specific users?
 - Specific applications?



CPU Utilization and Waits Overview

CPU Utilization and Waits Overview is an excellent starting place. Look for *interesting* points. Next steps will depend upon the answer to the prior questions, along with what you see.

CPU Utilization and Waits Overview



IBM i 7.3 Performance Tools – Better than Ever!

IBM i 7.3 Performance Tools – Better than Ever!

- Historical Data
 - Collection Services support for Historical Data
 - Graph History
- IBM Navigator for i
 - System Monitors
 - Additional metrics
 - Visualize monitor data
 - New Dashboard

Collection Services Support for Historical Data

http://www.ibm.com/support/knowledgecenter/en/ssw_ibm_i_73/rzahx/rzahxcshstdtasupport.htm

Collection Services Support for Historical Data

Historical Data

Data collected by Collection Services and then **reduced** and **summarized** with the intent of providing data to be kept for a long period of time. The data is intended to be just a subset of all the original Collection Services collected data.

- A new performance collection type *HSTFILE will contain historical data as a file based performance collection.
- Data will be created from management collection objects in the configured collection library (e.g. QPFRDATA) when the Collection Services collector is cycled or ended.
 - A batch job named QYPSPFRHST will be submitted by the collector to create historical data.
 - Historical data will be stored in library QPFRHIST.

Historical Summary and Detailed Data

Summary Historical Data – *System-level and summarized metrics*

- Useful in identifying trends or detecting changes in a system over a long period of time.
- Stored in database files beginning with QAPMHM*.

Detail Historical Data – *The collected data saved for top contributors of each interval, as well as other relevant supplementary data.*

- Supporting data for the summarized metrics.
- Only the top contributors for each metric will be stored as historical detail data.
- This type of data is stored in database files beginning with QAPMHD*.

Historical Summary Database Files

Historical Summary Files	Description
QAPMHCONF	Control file
QAPMHBKTD	Bucket Definition File (Job Wait and Disk Response Time)
QAPMHMCMN	Summary Communication Metrics
QAPMHMDSK	Summary Disk Metrics
QAPMHMJMI	Summary JOBMI Metrics
QAPMHMJOS	Summary JOBOS Metrics
QAPMHMPOL	Summary Main Storage Pool Metrics
QAPMHMSYS	Summary System Metrics
QAPMHMISUM	Interval Summary Data
QAPMHMSYST	Summary System Data
QAPMHMSQLP	Summary SQL Plan Cache Data

http://www.ibm.com/support/knowledgecenter/en/ssw_ibm_i_73/rzahx/rzahxhstfiles.htm

Historical Detail Database Files

Historical Detail Files	Description
QAPMHDDISK	Detailed Disk Data
QAPMHDJOBM	Detailed JOBMI Data
QAPMHDJOBO	Detailed JOBOS Data
QAPMHDPPOOL	Detailed Main Storage Pool Data
QAPMHDCOMM	Detailed Communications Data

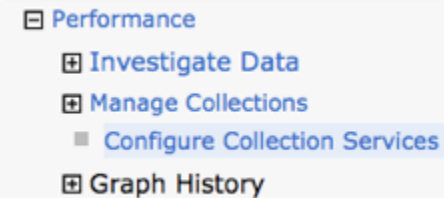
http://www.ibm.com/support/knowledgecenter/en/ssw_ibm_i_73/rzahx/rzahxhstfiles.htm

Configuring Historical Data in IBM Navigator for i

<https://www.ibm.com/developerworks/ibmi/library/i-new-way-to-analyze-historical-performance-data-trs/>

Enabling Historical Data

- Historical data is **OFF** by default
- Enable historical data in Configure Collection Services
 - Historical data is created at collection cycle time



Configure Collection Services

General

Library: QPFRDATA

Default collection interval: 15 seconds **5 minutes**

Cycling

Cycle every day at: 12:00 AM Example: 12:30 PM

Cycle every: 24 hours

System options

- ☒ Enable system monitoring
- ☒ **Create historical data when collection is cycled**
- ☒ Create database files during collection
- ☒ Create performance summary data when collection is cycled

The Configure Performance Collector (**CFGPFRCOL**) command also can be used to c

Historical Data Retention Periods

The amount of historical data you can save will depend on whether or not you have PM Agent running.

	Maximum	Default
Summary Data without PM Agent active	1 month	1 month
Detailed Data without PM Agent active	7 days	7 days
Summary Data with PM Agent active	600 months (50 years)	12 months
Detailed Data with PM Agent active	60 days	7 days

Historical Data Expiration

- Expired historical data will be deleted by the Collection Services collector (QYPSPFRCOL) expiration thread at cycle time.
- Records will be deleted from the historical database files that exceed the configured retention periods.

Historical Data Retention

- Retention period for summary and detail data depends on PM Agent status
 - Radio buttons will show whether PM Agent status is *ACTIVE or *INACTIVE
 - Select PM Agent On or Off to Start or Stop

Configure Collection Services

General

Data to Collect

Data Retention

System Monitor Categories

Historical Data

Collection object
Save data for: ☒ 30 days ☐ Make permanent

Standard data
Save data for: ☒ 10 days ☐ Make permanent

System monitor data
Save data for: ☒ 2 days ☐ Make permanent

Historical data

☐ PM Agent on ☒ PM Agent off

Save summary data for: year(s) Save summary data for: month

Save detail data for: days (1-60) Save detail data for: days (1-7)

[View disclaimer](#)

Collection Services – Historical Data Properties

Interval

Interval used to create all historical data

The screenshot shows the 'Configure Collection Services' window with the 'Historical Data' tab selected. The left sidebar contains a tree view with 'General', 'Data to Collect', 'Data Retention', 'System Monitor Categories', and 'Historical Data' (which is highlighted). The main content area is titled 'Historical Data' and contains two sections: 'Historical summary data' and 'Historical detail data'. Under 'Historical summary data', there is a 'Library' dropdown set to 'QPFRHIST' and an 'Interval' dropdown set to '60 Minutes'. Under 'Historical detail data', there is a checkbox labeled 'Create historical detail data' which is checked. Below this is a 'Filter' dropdown set to '20' with a text label 'Save this many top contributors of each detailed metric' to its right.

The screenshot shows the IBM Navigator for i interface. At the top, it says 'IBM® Navigator for i'. Below that is a 'Welcome Dashboard' section. There is a search bar with the text 'cycle' entered. Below the search bar, there is a list of items: 'Cycle Collection Services' (which is highlighted), 'Target Systems and Groups', and 'Favorites'. To the right of this list is a button labeled 'Cycle Collection Services'.

Historical detail data

Specify whether or not to create historical detail data

Filter

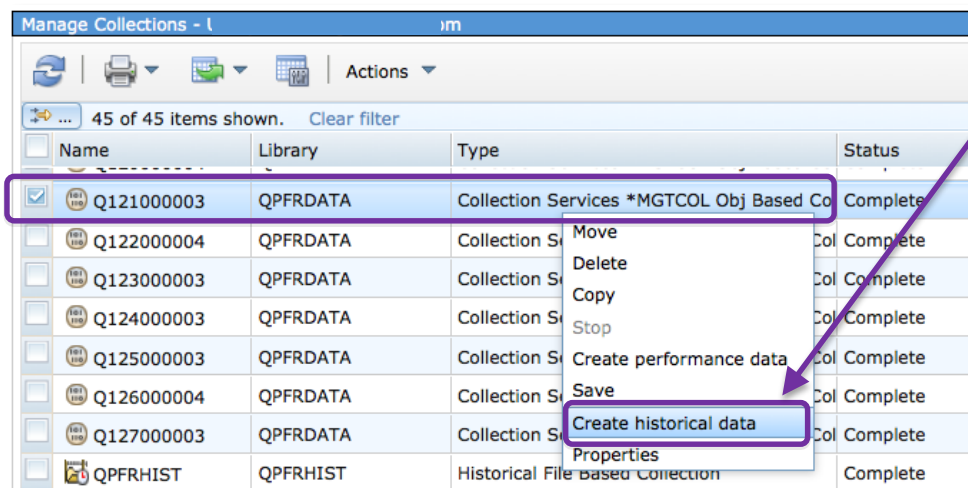
Specify the number of top contributors for each metric to be stored

This is seen in top contributors chart (default 20)

IBM Navigator for i Graph History

<https://www.ibm.com/developerworks/community/wikis/home?lang=en#!/wiki/IBM%20i%20Technology%20Updates/page/Graph%20History>

Manage Collections – Historical Data



Manage Collections - l

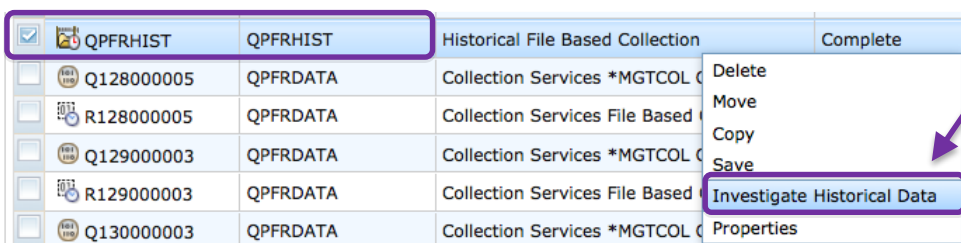
45 of 45 items shown. Clear filter

Name	Library	Type	Status
☒ Q121000003	QPFRDATA	Collection Services *MGTCOL Obj Based Co	Complete
☐ Q122000004	QPFRDATA	Collection S	Col Complete
☐ Q123000003	QPFRDATA	Collection S	Col Complete
☐ Q124000003	QPFRDATA	Collection S	Col Complete
☐ Q125000003	QPFRDATA	Collection S	Col Complete
☐ Q126000004	QPFRDATA	Collection S	Col Complete
☐ Q127000003	QPFRDATA	Collection S	Col Complete
☐ QPFRHIST	QPFRHIST	Historical File based Collection	Complete

- Move
- Delete
- Copy
- Stop
- Create performance data
- Save
- Create historical data
- Properties

Create historical data:

Historical data from this collection will be added to the Historical File Based

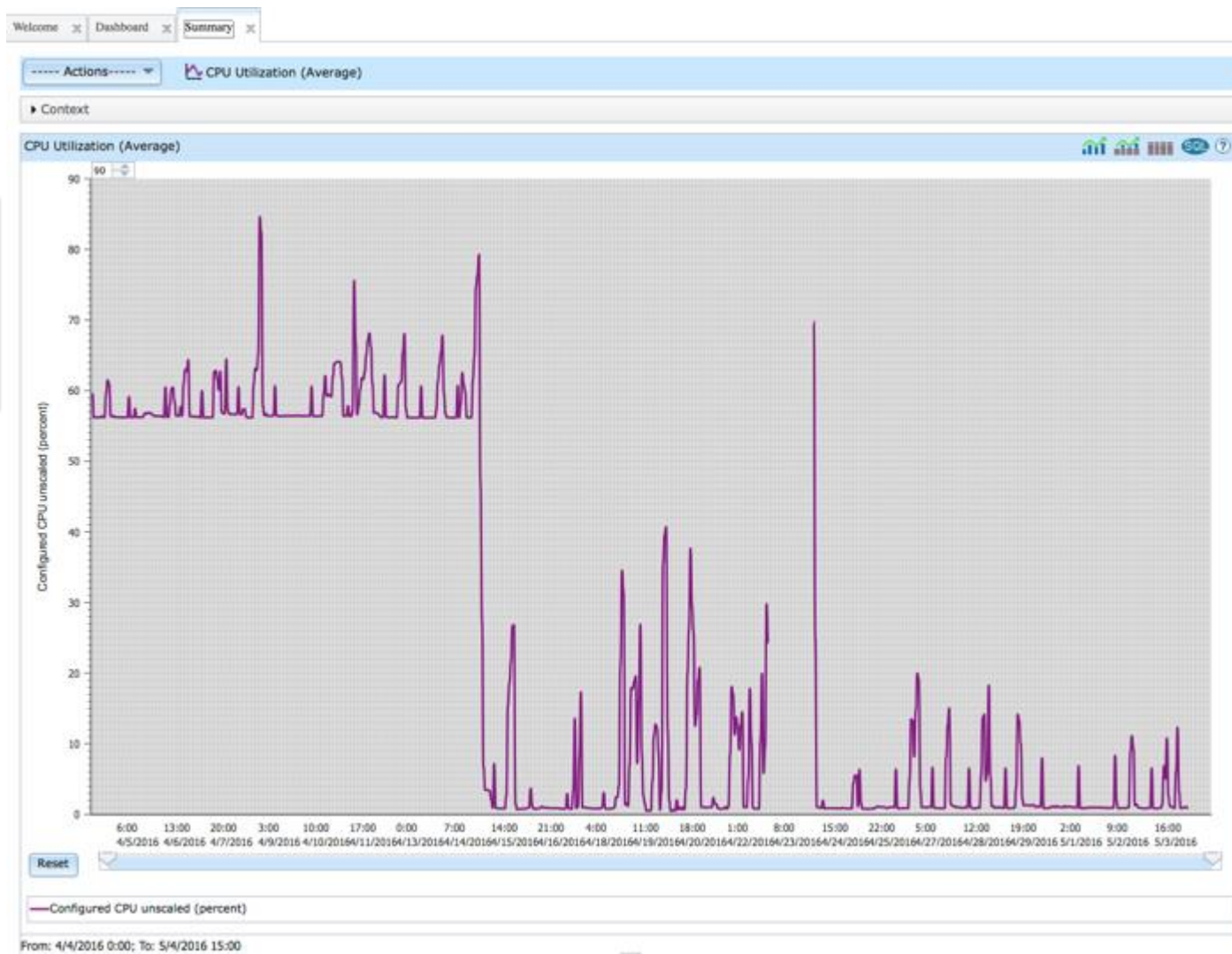


☒ QPFRHIST	QPFRHIST	Historical File Based Collection	Complete
☐ Q128000005	QPFRDATA	Collection Services *MGTCOL C	
☐ R128000005	QPFRDATA	Collection Services File Based	
☐ Q129000003	QPFRDATA	Collection Services *MGTCOL C	
☐ R129000003	QPFRDATA	Collection Services File Based	
☐ Q130000003	QPFRDATA	Collection Services *MGTCOL C	

- Delete
- Move
- Copy
- Save
- Investigate Historical Data
- Properties

Investigate Historical Data:

Launch to the graph history summary panel



- Performance
 - Investigate Data
 - Manage Collections
 - Configure Collection Services
- Graph History
 - Summary
 - Detail

Context

- Context is initially collapsed
- Expand it to select the metric and timeframe you wish to view

▼ Context

Metric:

CPU Utilization (Average) ▼

Collection Type:

*HSTFILE

Library:

QPFRHIST

Report Dates:

1 month ▼

Graph Interval:

1 hour ▼

From Date:

4/4/2016 ▼

Time:

00:00 ▼

To Date:

5/4/2016 ▼

Time:

13:46 ▼

Refresh

Summary Metrics

- Batch Logical Database I/O Rate
- CPU Utilization – Average, Interactive Jobs, SQL, Uncapped
- Communication Line Utilization – Average, Max
- Disk Arm Utilization – Average, Max
- Disk Arm Utilization for Independent ASP(s) – Average, maximum
- Disk Arm Utilization for System ASP – Average, maximum
- Disk Arm Utilization for User ASP(s) – Average, Maximum
- Disk Response Time – Read, Write
- Disk Storage Utilization – Average, Maximum
- Disk Storage Utilization for Independent ASP(s) – Average, Maximum
- Disk Storage Utilization for System ASP – Average, Maximum
- Disk Storage Utilization for User ASP – Average, Maximum
- Interactive Response Time – Average, Maximum
- Interactive Transaction Rate
- LAN Utilization – Average, Maximum
- Machine Pool Faults Rate
- Shared Processor Pool Utilization – Physical, Virtual
- Spool File Creation Rate
- Temporary Storage Utilization
- User Pool Faults Rate – Average, Maximum

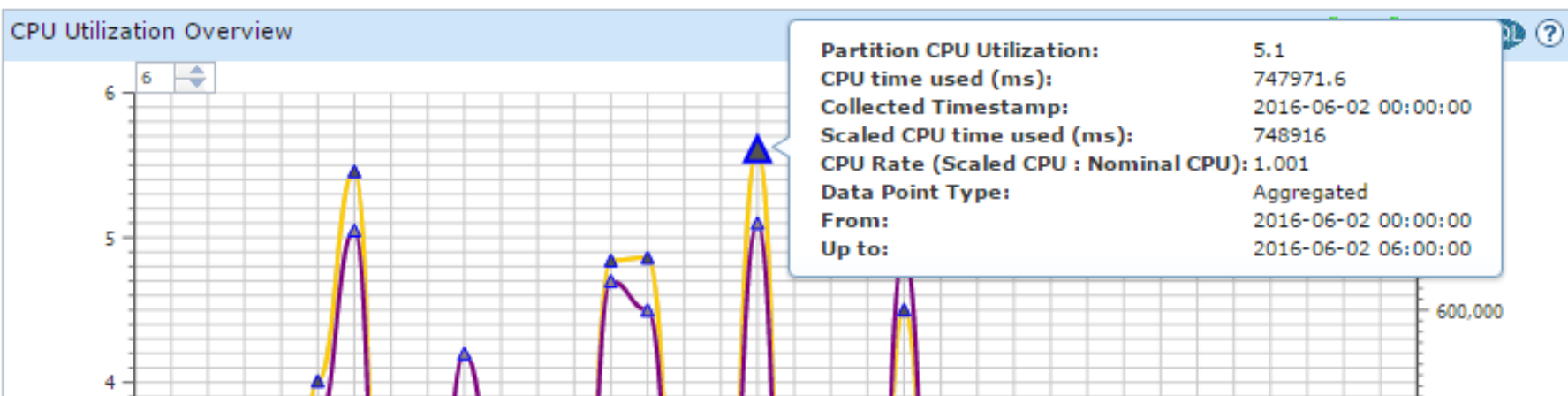
▼ Context	
Metric:	CPU Utilization (Average)]
Collection Type:	Batch Logical Database I/O Rate
Library:	CPU Utilization (Average)
Report Dates:	CPU Utilization (Interactive Jobs)
Graph Interval:	CPU Utilization (SQL)
	CPU Utilization (Uncapped)
	Communication Line Utilization (Avg)

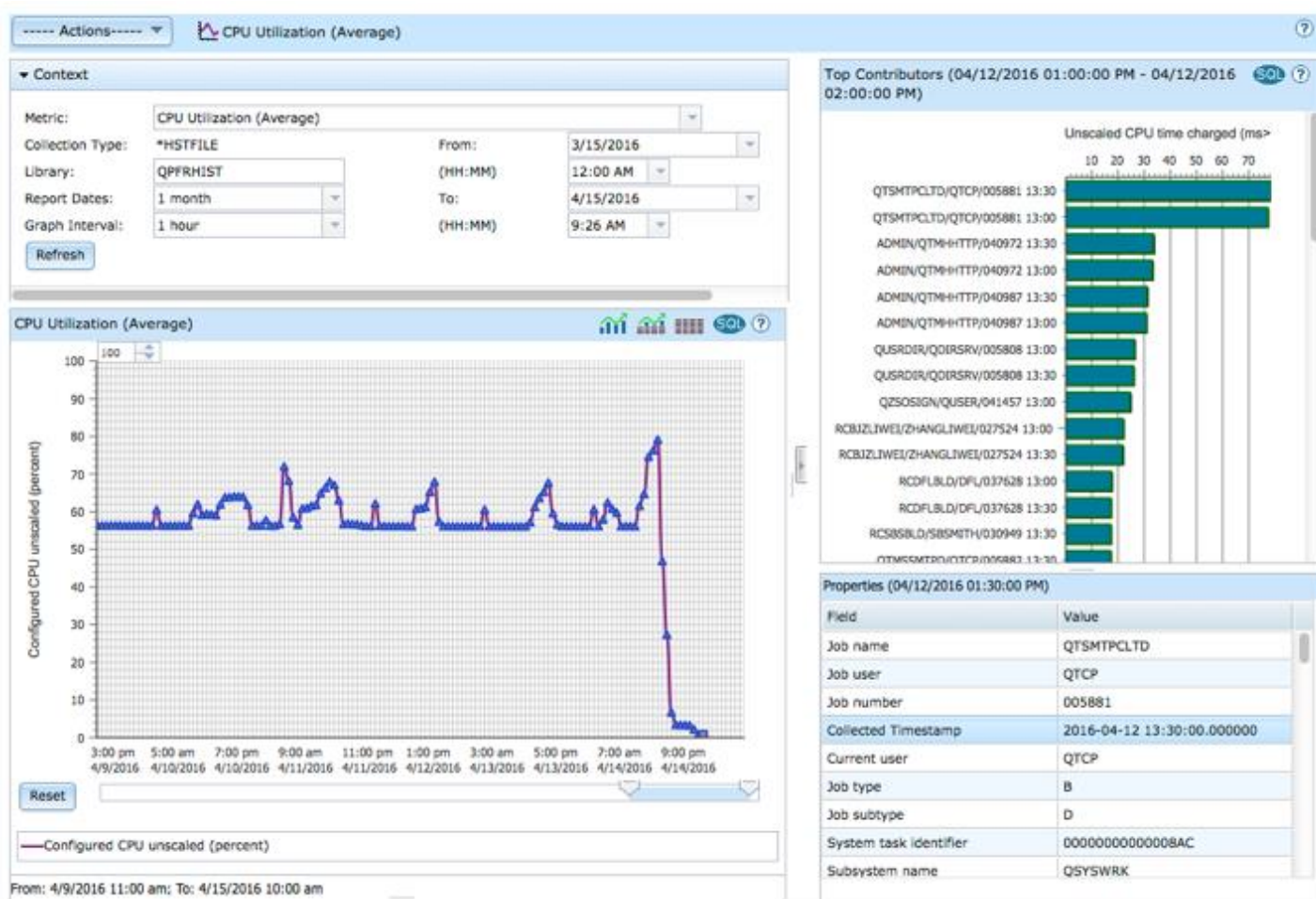
Refresh

Zoom in for Details

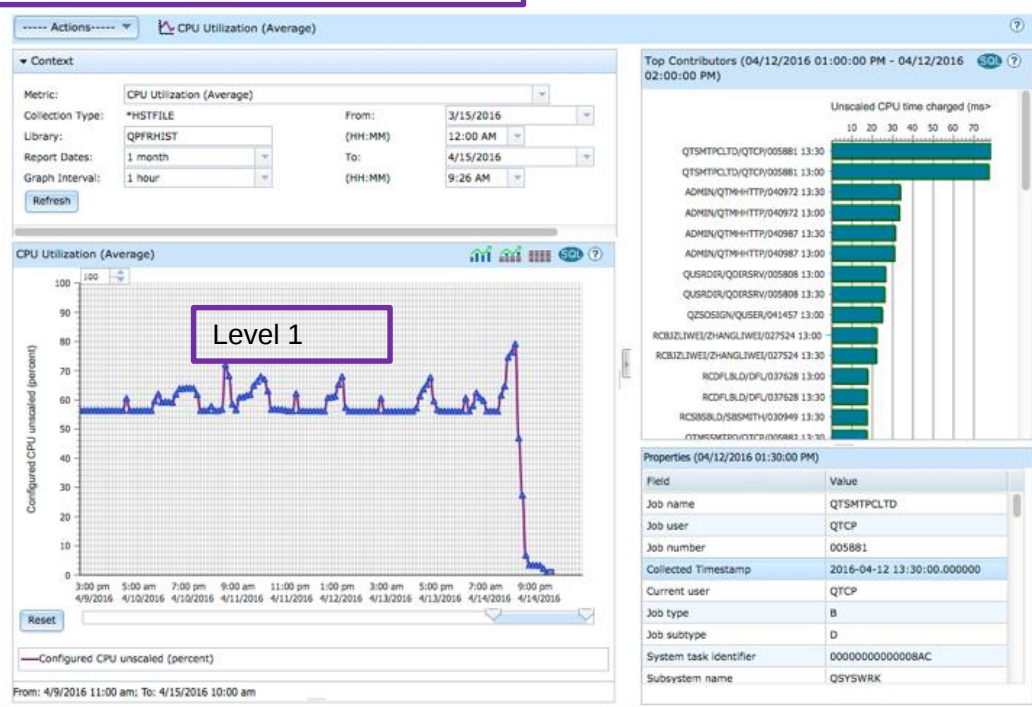


Hover Over Data Points for more Information





Select interval to view **top contributors**
Select top contributor to view **properties** panel



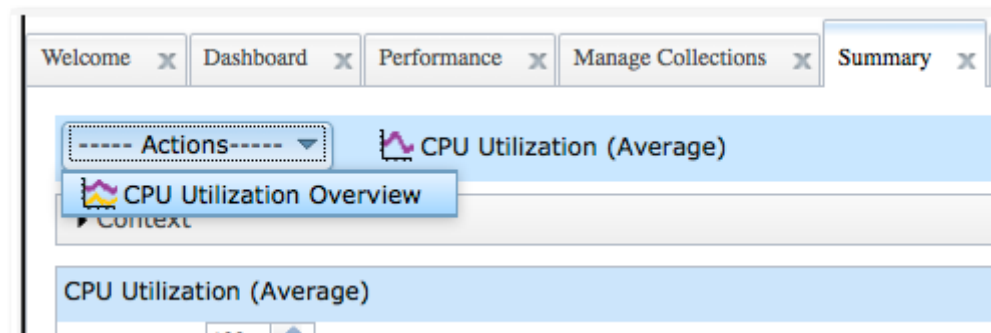
Level 2
Top Contributors

Level 3
Properties

Slider allows
customization of chart

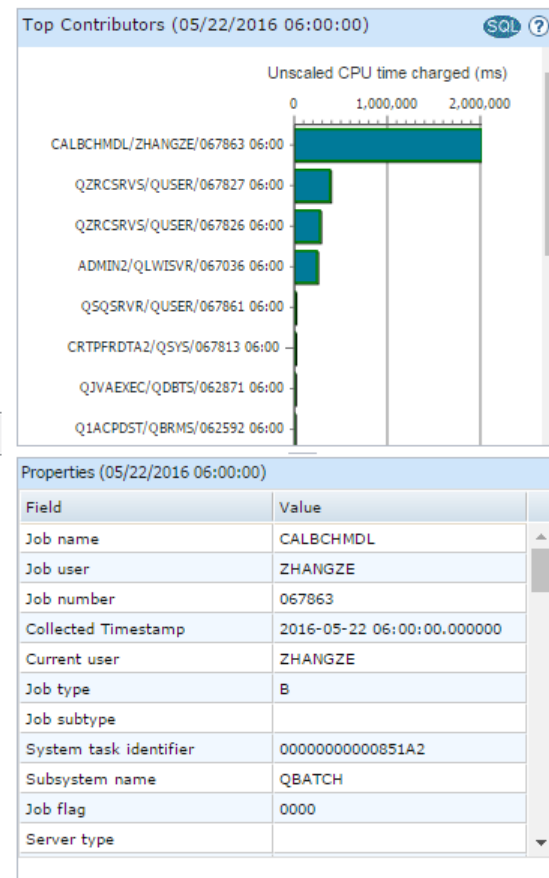
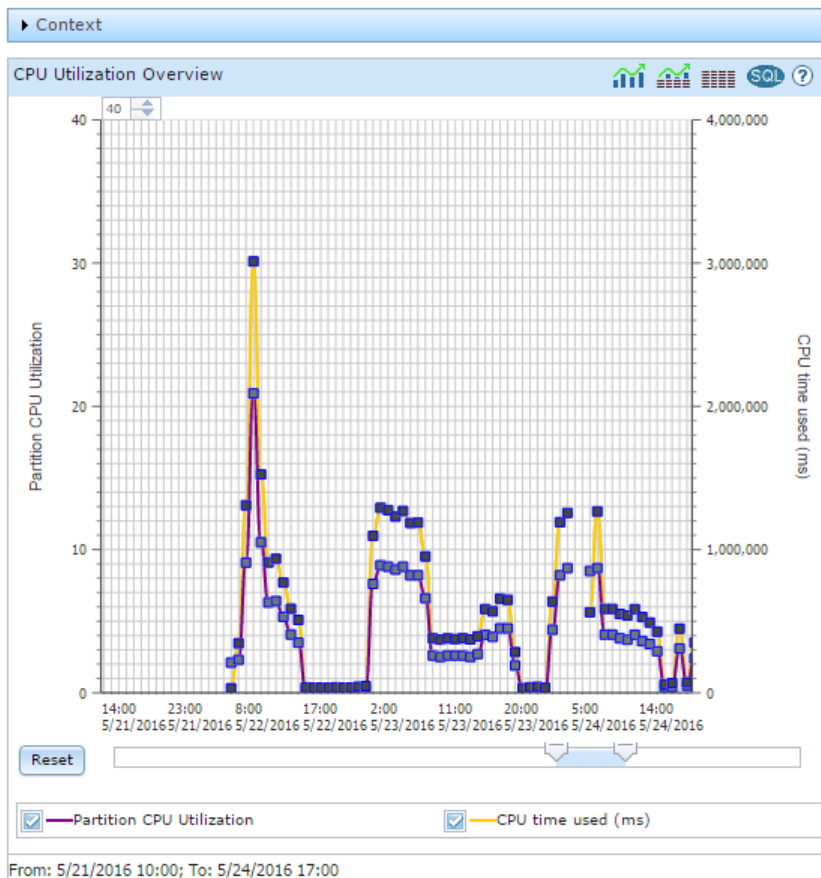
Actions

- From historical summary data, **Actions** allows you to launch Graph History composite charts
- At this time, there is only one composite chart
 - CPU Utilization Overview



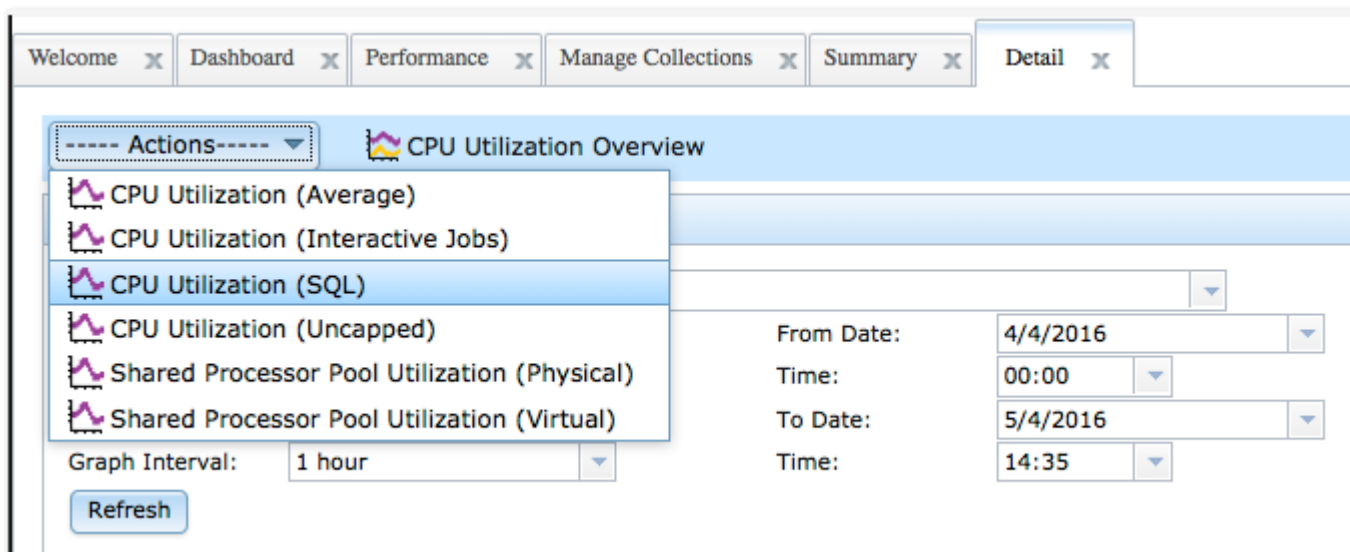
Historical Data – Composite

- Performance
 - Investigate Data
 - Manage Collections
 - Configure Collection Services
 - Graph History
 - Summary
 - Detail



Historical Composite Chart - Actions

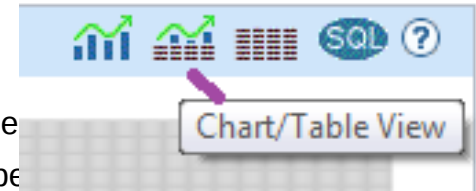
- **Actions** allows you to review historical summary data for additional metrics



Icons

- The five icons at the top right of the summary chart are as follows:

- **Chart only** – Select the chart icon to visualize the data on the chart. This is the
- **Chart & Table** – Select the combined chart and table icon to split the screen be
- **Table only** – Select the table icon to show the dataset only in table format.
- **Display SQL** – Select the SQL icon to display the query used to obtain the dataset charted on the graph.
- **Help** – Select the '?' icon for help text



- Maximum graph value** - You can specify the maximum value for the height of the y-axis

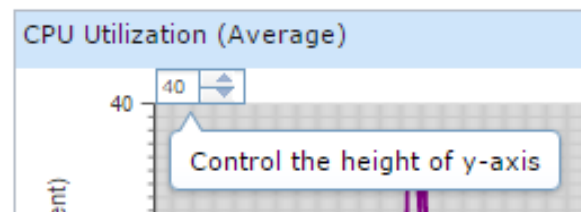
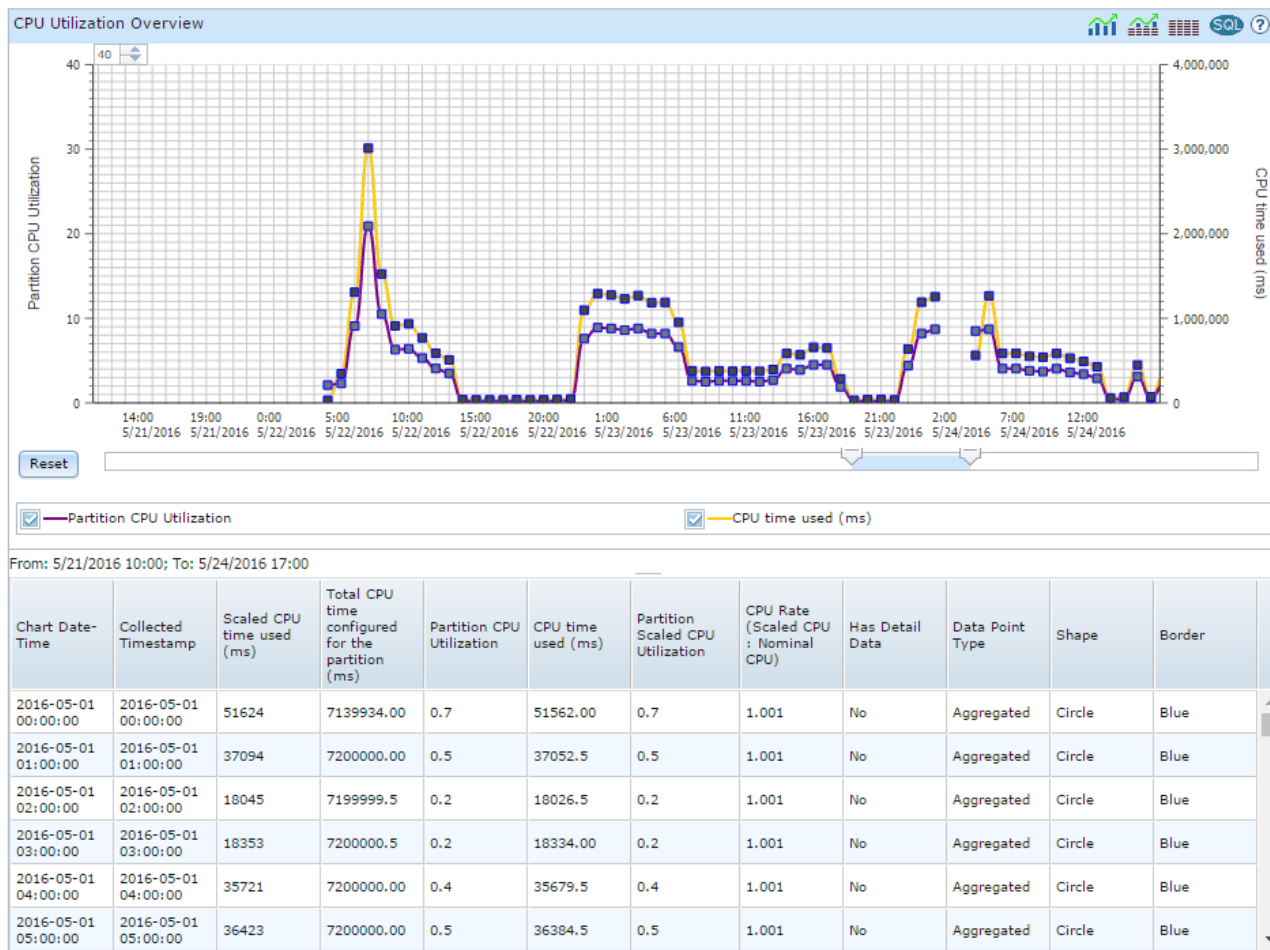
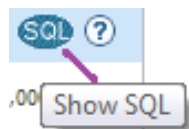


Chart and Table



SQL



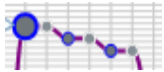
SQL Statement

```

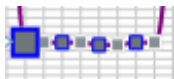
/** CPU Utilization (Overview) */
SELECT QSYS.DATETIME AS DATETIME,
       SYSSPTU,
       SYSCTA,
       COLPCTCPU,
       SYSPUTU,
       COLPCTSCPU,
       SPURR_PURR_RATIO,
       CASE
         WHEN QSYS.NUM_DATA_POINTS > 1
           THEN 'NO'
         ELSE 'YES'
       END AS "IS_SINGLE_POINT",
       CASE
         WHEN QSYSDT.DATETIME2 IS NULL
           THEN 'NO'
         ELSE 'YES'
       END AS "HAS_DETAILED_DATA"
FROM (
  SELECT MIN(DATETIME) DATETIME,
         AVG(SYSSPTU) AS SYSSPTU,
         AVG(SYSCTA) AS SYSCTA,
         AVG(SYSPUTU / DOUBLE (SYSCTA) * 100) AS COLPCTCPU,
         AVG(SYSPUTU) AS SYSPUTU,
         AVG(SYSSPTU / DOUBLE (SYSCTA) * 100) AS COLPCTSCPU,
         AVG(DOUBLE (SYSSPTU / SYSPUTU)) AS SPURR_PURR_RATIO,
         COUNT(*) AS NUM_DATA_POINTS
  FROM QPFRHIST.qapmhmsyst
  WHERE DATETIME >= '2016-04-04 00:00:00'
        AND DATETIME <= '2016-05-04 14:25:02'
        GROUP BY YEAR(DATETIME),MONTH(DATETIME),DAY(DATETIME),HOUR(DATETIME)
) QSYS
LEFT JOIN (
  SELECT DISTINCT j.DATETIME AS DATETIME2
  FROM QPFRHIST.QAPMHDJOBM j,
       QPFRHIST.QAPMHMSYST s
  WHERE s.DATETIME = j.DATETIME
) QSYSDT ON QSYS.DATETIME = QSYSDT.DATETIME2
ORDER BY DATETIME
  
```

OK

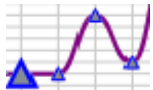
Understanding the Data Points



CIRCLE - **summary historical data** only



SQUARE represents a **collected** (blue border) or **extended** (white border) data point.



TRIANGLE represents an **aggregated** data point.

Square and triangle data points - both have historical **detail data** available

- Click on these to see the Top Contributors data for that interval.

Understanding the Data Points – the details

Collected - the value charted was taken from a historical database file.

Aggregated - the value charted is calculated from multiple intervals in the historical database files.

- For example, if data is collected at 15 minute intervals and the chart is showing 1 hour graph intervals, the data point will be an aggregate of 4 time intervals combined.

Extended - the value charted for that time interval is not available in the historical database file. The data point is extended from the next earlier interval value.

- For example, if data is collected at 30 minute intervals and the chart is showing 5 minute graph intervals, the data points between the collected intervals will be extended.

IBM i 7.3 Performance Tools – Better than Ever!

- Historical Data
 - Collection Services support for Historical Data
 - Configuring in IBM Navigator for i
 - Graph History
- **IBM Navigator for i**
 - **System Monitors**
 - **Additional metrics**
 - **Visualize monitor data**
 - **Dashboard**

IBM Navigator for i System Monitor Enhancements

Additional System Monitor Metrics

- HTTP system monitor metrics in new file QAPMSMHTTP
- Disk response time (read and write)



Disk Response Time (Read and Write)	The response time that disk units experienced on your system.
HTTP Requests Received Rate	The number of requests received per second for all HTTP servers.
HTTP Requests Received (Maximum)	The largest number of HTTP requests received by a single server.
HTTP Responses Sent Rate	The number of responses sent per second for all HTTP servers.
HTTP Responses Sent (Maximum)	The largest number of HTTP responses sent by a single server.
HTTP Non-Cached Requests Processed (Average and Maximum)	The number of non-cached requests processed for HTTP servers.
HTTP Error Responses Sent (Average and Maximum)	The number of error responses sent for HTTP servers.
HTTP Non-Cached Requests Processing Time (Total and Highest Average)	The processing time for non-cached requests for HTTP servers.
HTTP Cached Requests Processing Time (Total and Highest Average)	The processing time for cached requests for HTTP servers.

System Monitors – All Metrics graphing == Visualize Monitor Data

- **All Metrics** or **Visualize Monitor Data** action from System Monitor
- View all monitored metrics on one panel

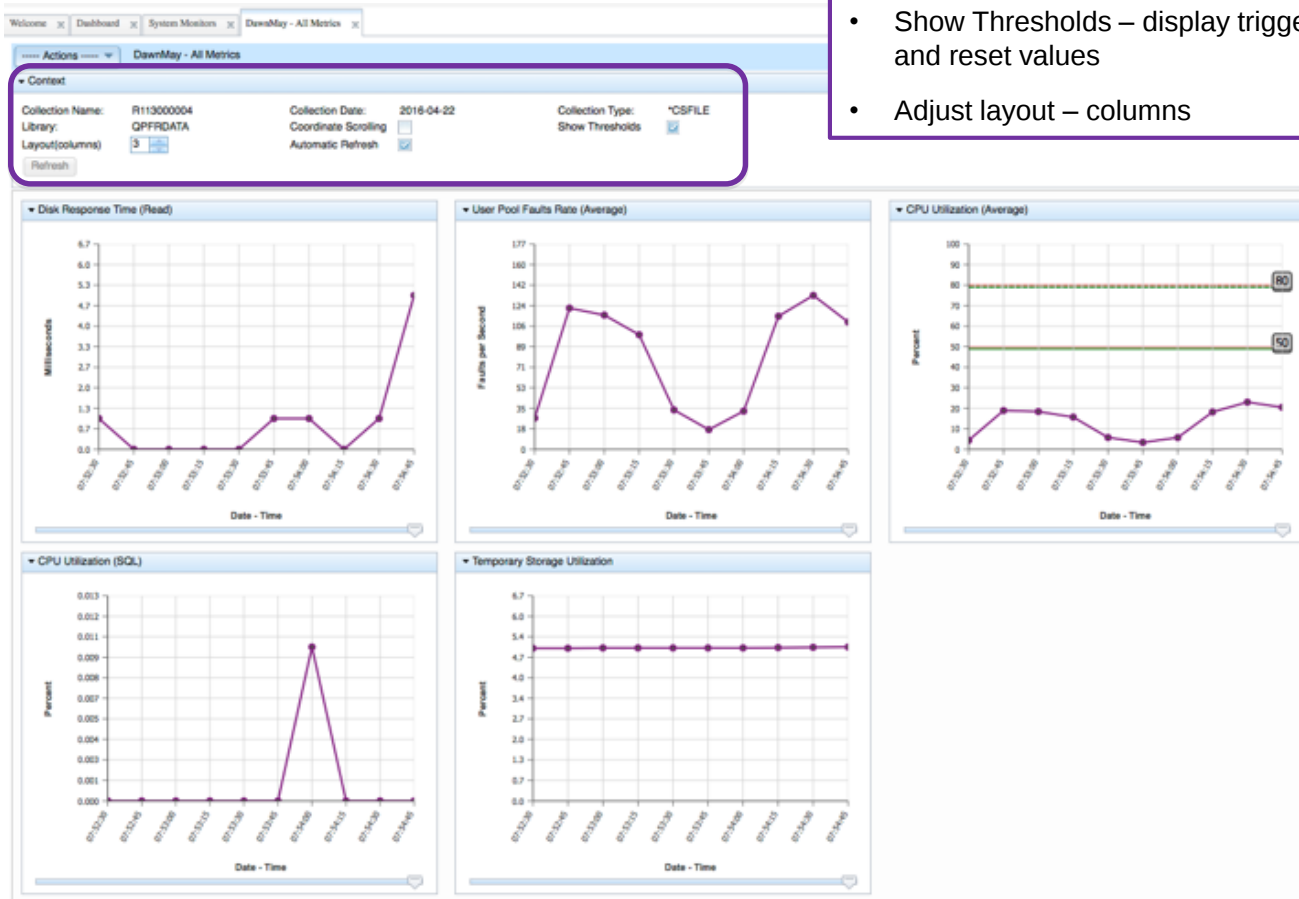
☐	Monitor	Status	Metrics	Description
☐	monitor2	1 threshold triggered	Disk Response Time (f	
☐	monitor	Started	Communications Line	
☒	DawnMay	Started	Disk Response Time (f Example Sy	
☐	Visualize Monitor Data	pped	LAN Utilization (Avera	
	Investigate Monitor Data	All Metrics		
	Event Log	Disk Response Time (Read)		
	Start	User Pool Faults Rate (Average)		
	Stop	CPU Utilization (Average)		
	New Based On	CPU Utilization (SQL)		
	Delete	Temporary Storage Utilization		
	Properties			

- Real-time visualization of monitor data
- Automatic refresh
- Coordinated scrolling across graphs

... and now available with latest 7.2 PTF

System Monitors – All Metrics

- Coordinate scrolling
- Show Thresholds – display trigger and reset values
- Adjust layout – columns



Actions when Visualizing All Metrics

Each of these actions will open a new tab and display the charts for the metric selected

Historical summary using Graph History

Investigate Data charts for Monitor data

Investigate Data charts for Collection Services

Actions DawnMay - All Metrics

- Disk Response Time (Read)
- User Pool Faults Rate (Average) ▸
 - Historical Summary->User Pool Faults Rate (Average)
- CPU Utilization (Average) ▸
 - System Monitor->User Pool Faults Rate (Average)
- CPU Utilization (SQL) ▸
 - System Monitor->User Pool Faults Rate (Maximum)
- Temporary Storage Utilization ▸
 - Collection Services->Page Faults Overview
 - Collection Services->Memory Pool Sizes and Fault Rates
 - Collection Services->Resource Utilization Overview

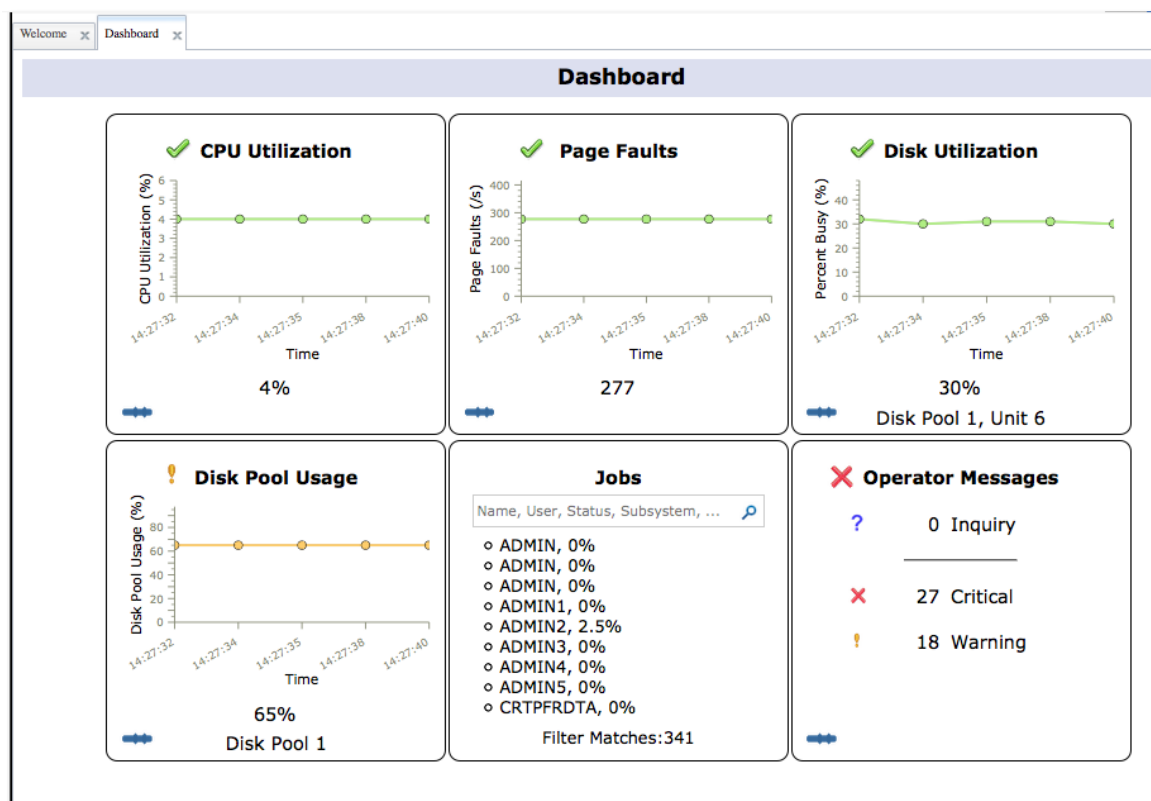
Refresh

IBM Navigator for i Dashboard

Dashboard

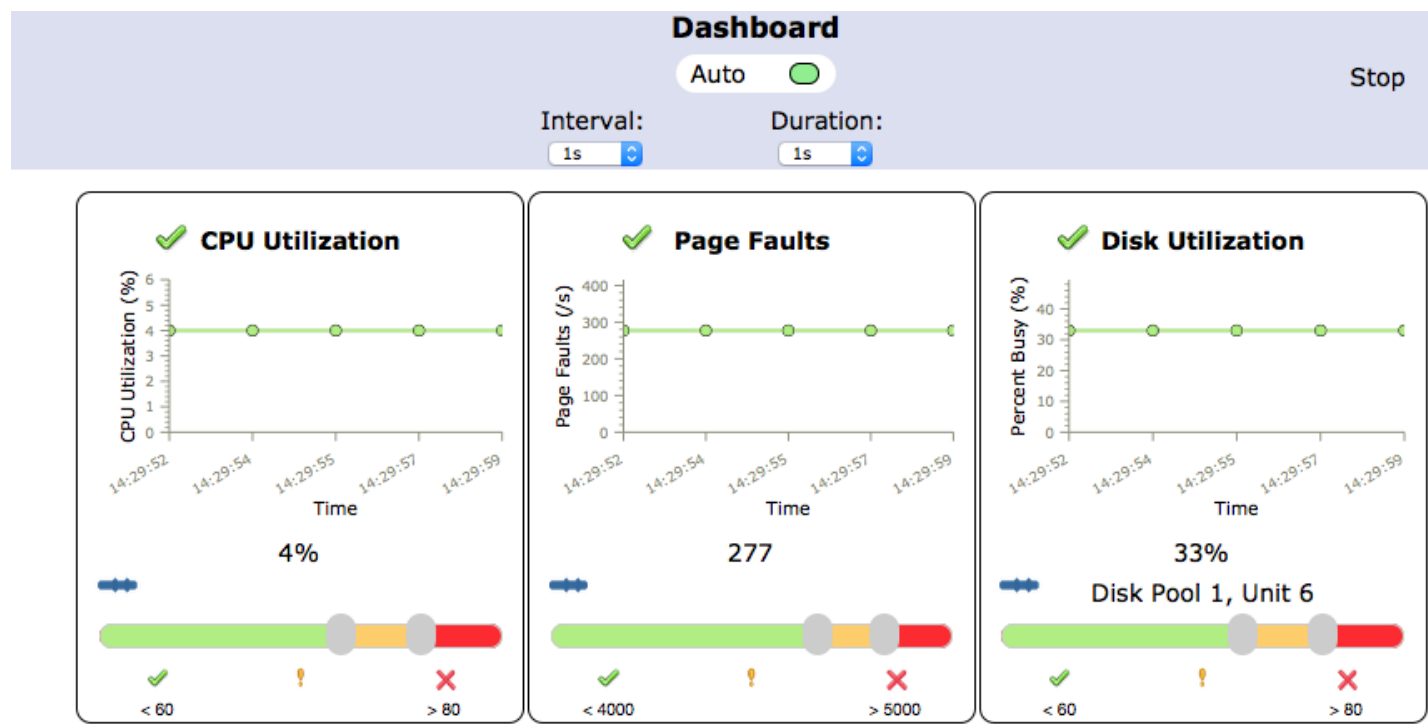
- Initial display when logging into Navigator for i

... and now available with latest 7.2 P

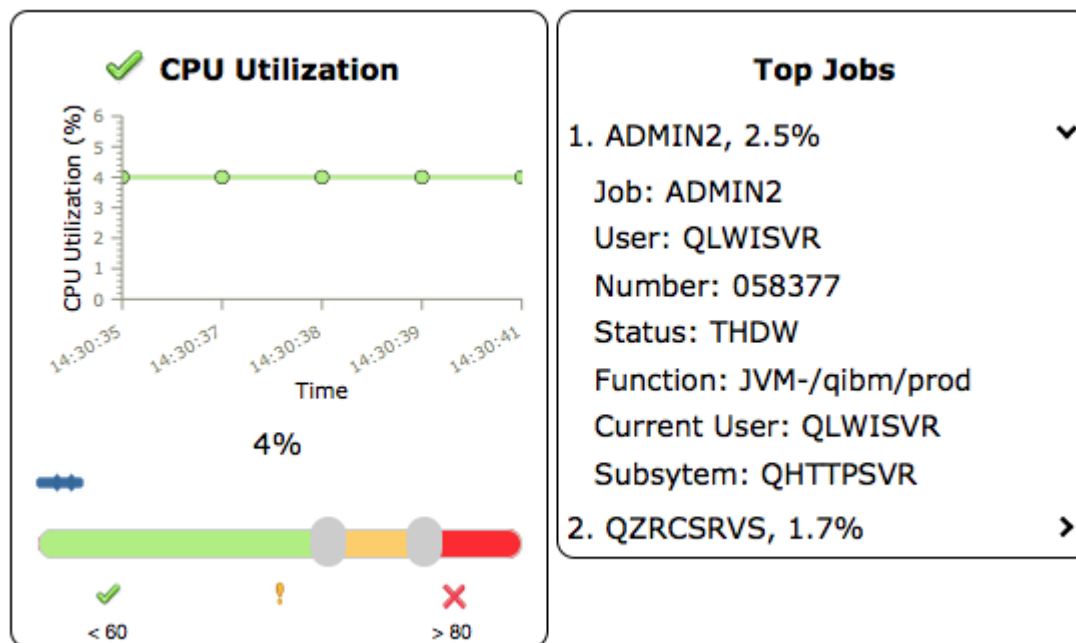


Configurable intervals and thresholds

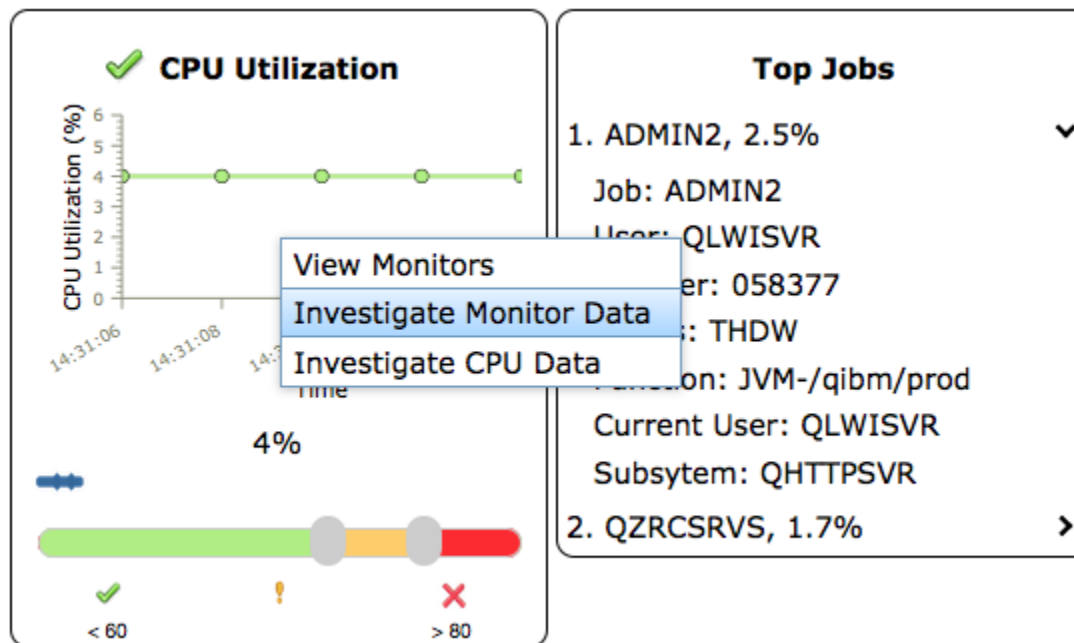
- Metrics updated in real time
- Set thresholds to visualize potential issues



Basic Drill-Down Capabilities



Drill-down to System Monitors and Investigate Data

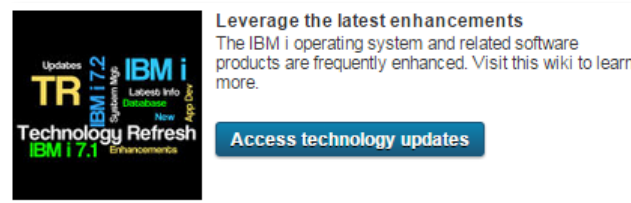


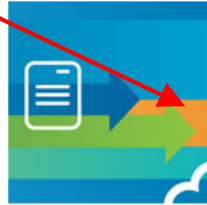
Performance Data Investigator:

- Introduction to PDI
- 7.3 – Better than Ever!
 - Historical Data & Graph History
 - System Monitor – Visualization
 - Dashboard

IBM i Performance Tools on developerWorks

- IBM i developerWorks - <http://www.ibm.com/developerWorks/ibmi/>
- Performance Tools Technology Updates
<https://www.ibm.com/developerworks/ibmi/techupdates/perftools>
 - Articles
 - Presentations
 - Forum
 - Blogs





Leverage the latest enhancements
The IBM i operating system and related software products are frequently enhanced. Visit this wiki to learn more.

[Access technology updates](#)

IBM i Technology Updates - by IBM i product or subject matter
Backup Recovery and Media Services (BRMS)
Collaboration and Social for i (Lotus)
DB2 for i (Database)
General IBM i operating system
Hardware and Firmware (including Technology Refresh content)
IBM i Access Client Solutions
IBM Integrated Web Services for i
Integration with BladeCenter and System x
Java on IBM i
Navigator
Performance Tools
PowerHA SystemMirror for i
Systems Director for i
Web Integration on i

Performance Tools

Updated February 6, 2013 by ShaunaRollings

Page Actions ▾

This section contains information about the collection tools, the performance components, and the performance reports (57xxPT1).

Performance Data Collectors

Collection Services, Disk Watcher, Job Watcher, and other performance related tools and Analyze Command Performance.

Performance on the Web

The Performance components of IBM i are managed by the **Investigator (PDI)** and the **Manager (PMI)**, which are web-based GUI interfaces for Collection Services and the Performance Tools LPP.

Performance Tools LPP (57xxPT1)

Performance Tools is a licensed program that provides performance data collection tools and reports. More information on the Performance Tools LPP is available in the [Performance Tools LPP](#) page.

Additional IBM i Performance Tools

Performance Tools

Performance Data Collection

Performance on the web

Enhancements and New Features

Browser Tips

Authority

PDI tips and techniques

Resources

Blog Posts

Wait Buckets

includes Performance data collection tools LPP (Licensed program)

data collection tools supported on IBM i for more information (DMPMEMINF).

navigator

IBM Navigator for i

PTFs

Enhancements list

Service Availability

System Monitors

Dashboards

Creating a Certificate...

Disk Management

Integrated file system

details	7.3 5770 PTFs	7.2 5770SS1 PTFs	7.1 5770SS1 PTFs
June 2016 SP details	SI60484	SI60247	SI60517
	SI60483	SI60248	SI60518
	SF99722 level 3	SF99713 level 16	SF99368 level 42
	SF99725 level 2	SF99716 level 10	SF99572 level 25
	SF99723	SF99714 level 4	SF99145 level 11
	SF99703	SF99702 level 13	SF99701 level 40
	SF99731 - all	SF99721 - all PTF	

<https://www.ibm.com/developerworks/home?lang=en#/wiki/IBM%20i%20Technology%20Updates/page/Performance%20Tools>

<https://www.ibm.com/developerworks/community/wikis/home?lang=en#/wiki/IBM%20i%20Technology%20Updates/page/PTFs>



ithankyou

www.ibm.com/power/i

References

iDoctor versus Performance Data Investigator

There are two graphical interfaces for performance data analysis...which should you use?

Feature	iDoctor	PDI
Interface	Windows client	Browser
Wait Analysis	Yes	Yes
Collection Services	Yes	Yes
Job Watcher	Yes	Yes
Disk Watcher	Yes	Yes
Performance Explorer	Yes	Profile collections only
Database	Yes	Yes
Job Watcher Monitors	Yes	No
Customizable	Yes	Yes
User Defined graphs and queries	Yes	Yes
Update Frequency	Monthly Experimental features	Twice Yearly
Support	Defect only	Standard SWMA
Chargeable	Yearly license	•Collection Services at no additional charge with i •Disk Watcher, Database, and Performance Explorer included with base PT1 product •Job Watcher is an additional option of PT1 and has an additional charge
Experimental Features	Yes (e.g., VIOS Investigator)	No
Multinational language support	No	Yes

- developerWorks - <http://www.ibm.com/developerworks/ibmi/>

- Performance Tools

- [Additional performance tools resources](#)
 - [Performance on the Web](#)
 - [Performance Data Collectors](#)



Leverage the latest enhancements

The IBM i operating system and related software products are frequently enhanced. Visit this wiki to learn more.

[Access technology updates](#)

- Forum

<https://www.ibm.com/developerworks/forums/forum.jspa?forumID=2751>

- IBM i Performance Data Investigator

<http://www.ibm.com/developerworks/ibmi/library/i-pdi/index.html>

- IBM i Performance Data Investigator – Edit Perspectives

<http://www.ibm.com/developerworks/ibmi/library/i-pdiedit/index.html>

- IBM i Wait Accounting

<http://www.ibm.com/developerworks/ibmi/library/i-ibmi-wait-accounting/>

- How to use the Batch Model performance tool

<https://www.ibm.com/developerworks/ibmi/library/i-how-to-use-the-batch-model-performance-tool/>

IBM i Performance FAQ – a MUST read!

http://www.ibm.com/common/ssi/cgi-bin/ssialias?subtype=WH&infotype=SA&appname=STGE_PO_PO_USEN&htmlfid=POW03102USEN&attachment=POW03102USEN.PDF

IBM Power Systems Performance



IBM i on Power - Performance FAQ
April 12, 2016

<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/health-indicators-in-the-performance-data-investig/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/ibm-i-storage-allocation-perspectives/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/ibm-i-performance-analysis/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/ibm-power-virtualization-performance-powervp/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/view-memory-pools-and-faulting-with-the-performanc/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/ibm-i-wait-accounting/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/viewing-job-level-sql-metrics-with-the-performance/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/anticipating-the-future/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/job-level-sql-metrics-in-collection-services/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/performance-reports-with-the-performance-data-inve/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/ibm-i-performance-frequently-asked-questions/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/commands-to-manage-performance-collections/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/performance-data-investigator/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/performance-data-collectors-in-ibm-i/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/performance-data-investigatorbetter-than-ever/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/job-performance-information/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/cpf1240-and-cpf1241-messages-contain-summary-perfo/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/i-can-find-all-my-performance-collections-in-one-p/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/lesser-known-features-of-work-with-system-activity/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/customizing-a-perspective-in-pdi/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/new-systems-director-navigator-service-packs/>
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<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/i-can-collect-more-performance-data-in-71/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/i-can-measure-disk-response-times/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/i-can-understand-scaled-cpu-time/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/i-can-use-power7-features-with-ibm-i-611/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/i-can-analyze-command-performance/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/i-can-tell-you-why-youre-waiting/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/i-can-display-cpu-utilization-for-all-partitions/>
<http://www.ibmssystemsmag.com/Blogs/i-Can/Archive/i-can-investigate-performance-data/>

IBM i Web Sites with Performance Information

★ IBM Knowledge Center

- [7.1](#)
- [7.2](#)
- [7.3](#)

★ [IBM i Performance Management](#)

This web site has a lot of GREAT references and papers – see the [resources](#) tab

- [Performance Management for Power Systems](#)
- [IBM Workload Estimator](#)
- [iDoctor](#)
- [Job Waits Whitepaper](#)

Performance Management on IBM i Web Site

<http://www-03.ibm.com/systems/power/software/i/management/performance/index.html>

IBM Systems > Power Systems > Software > IBM i > System management >

Performance management on IBM i

Overview

Tools

Performance Explorer

Resources

Find what you need

Performance Data Collectors

There are four collectors on IBM i that collect performance related data and store the information in database files, each having their own unique characteristics: Collection Services, IBM i Job Watcher, IBM i Disk Watcher, and Performance Explorer.

Performance Data Investigator (PDI)

Use the Investigate Data task found in the web-based IBM Systems Director Navigator for i to view and analyze the data collected from any of the four data collectors found on IBM i. This powerful tool allows you the ability to work with the data interactively in chart or table form.

iDoctor for IBM i

A family of products (including Job Watcher, PEX Analyzer, and Heap Analysis Tools for Java) focused on assessing the overall health of a system by providing automated analysis on a variety of performance related data.

PM for Power Systems

A tool that can automatically collect system utilization information and can produce regular reports which show the utilization and growth trends of your system.

Performance and Scalability Services

Plan and prepare for changes in the data center when using the IBM i operating system on Power Systems hardware with help from IBM Systems Lab Services and Training. Whether

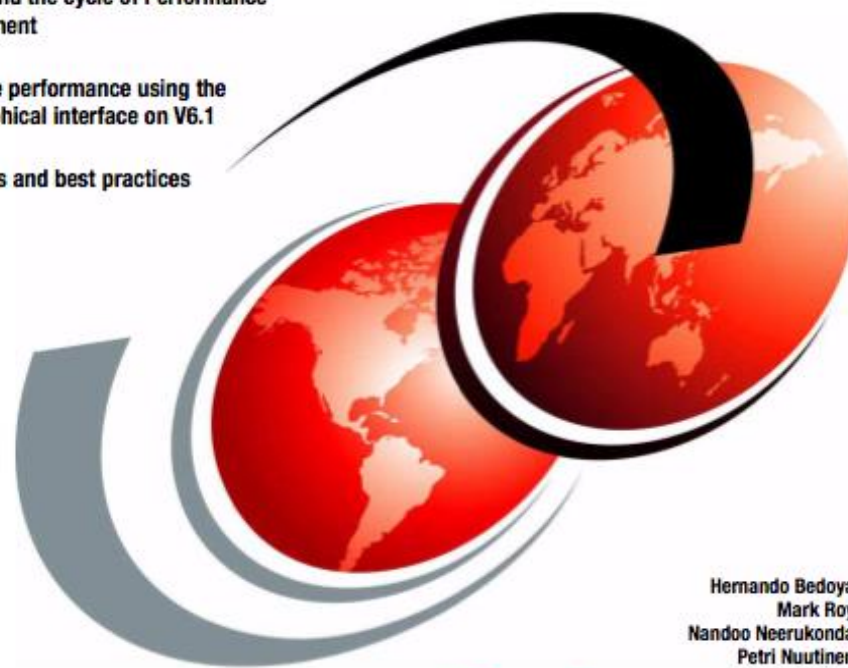
A Redbooks publication

End to End Performance Management on IBM i

Understand the cycle of Performance
Management

Maximize performance using the
new graphical interface on V6.1

Learn tips and best practices



Hernando Bedoya
Mark Roy
Nandoo Neerukonda
Petri Nuutinen

<http://www.redbooks.ibm.com/redbooks/pdfs/sg247808.pdf>

ibm.com/redbooks

Redbooks

IBM i Performance and Optimization Services

The IBM i Performance and Optimization team specializes in resolving a wide variety of performance problems. Our team of experts can help you tune your partition and applications, including:

- Reducing batch processing times

- Resolving SQL query and native IO performance problems

- Tuning RPG, COBOL, C, and Java (including WebSphere Application Server) programs

- Removing bottlenecks, resolving intermittent issues

- Resolving memory leaks, temporary storage growth problems, etc.

- Tuning memory pools, disk subsystems, system values, and LPAR settings for best performance

- Optimizing Solid State Drive (SSD) performance

- Tuning client interfaces such as ODBC, JDBC, .Net and more

Skills transfer and training for performance tools and analysis also available!

Contact Eric Barsness at ericbar@us.ibm.com for more details.

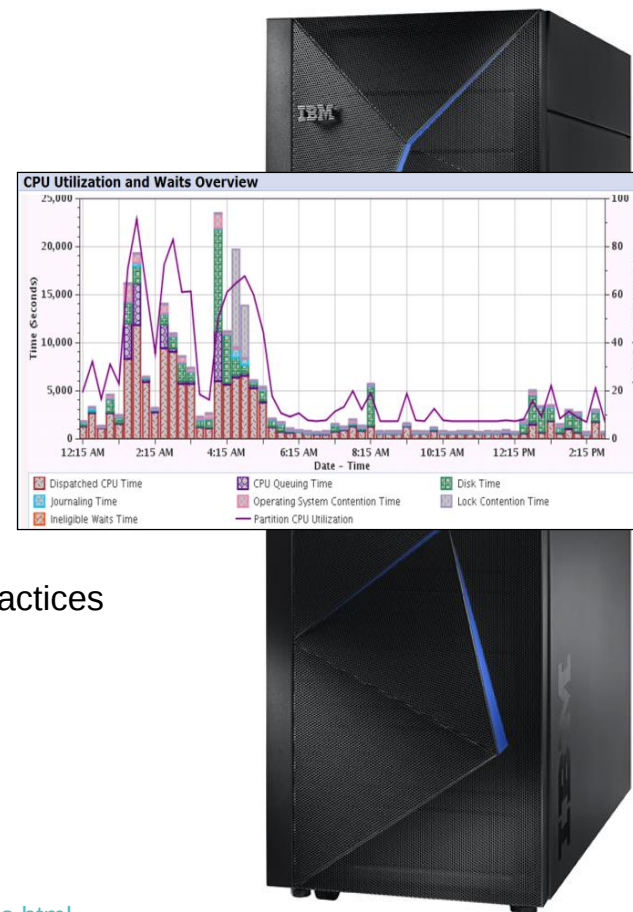
www.ibm.com/systems/services/labservices

IBM i Performance Analysis Workshop

Managing and analyzing the data can be quite complex. During this workshop, the IBM Systems Lab Services IBM i team will share useful techniques for analyzing performance data on key IBM i resources, and will cover strategies for solving performance problems. It will aid in building a future foundation of performance methodology you can apply in your environment.

Overview:

- Topics covered include:
 - Key performance analysis concepts
 - Performance tools
 - Performance data collectors (Job Watcher, Disk Watcher, etc.)
 - Wait accounting
- Core methodology and analysis of:
 - Locks
 - Memory
 - I/O subsystem
 - CPU
- Concept reinforcement through case studies and lab exercises
- May include discussions on theory, problem solving, prevention and best practices



Workshop details:

- Intermediate IBM i skill level
- 3 day workshop, public or private (on-site)

For public workshop availability and enrollment:

<http://www-03.ibm.com/systems/power/software/i/support/workshops/performance-analysis.html>

For additional information regarding private workshops, please contact Mike Gordon, STG Lab Services, at mgordo@us.ibm.com

Performance and Scalability Services

- The IBM i Performance and Scalability Services Center can provide facilities and hardware **IN ROCHESTER** to assist you in testing hardware or software changes
 - “Traditional” benchmarks
 - Release-to-release upgrades
 - Assess and tune application and database performance
 - Stress test your system
 - Determine impact of application changes
 - Proofs of Concept (e.g. HA alternatives; SSD analysis, external storage, etc.)
 - Evaluate application scalability
 - Capacity planning
- ... all with the availability of Lab Services IBM i experts and development personnel
- To request any of these services, submit at:
<http://www-03.ibm.com/systems/services/labservices/psscontact.html>

IBM i Solid State Drive Performance Services

Evaluate the benefits of SSD technologies with IBM i based applications

Features

- Three options to best meet client needs:
 1. Data collection on the client system with analytical services to determine the benefit SSDs will provide. The analysis also identifies which specific objects should be stored on SSDs to optimize benefits.
 2. Remote access to a fixed Power IBM i configuration to load and test client workloads on both SSDs and traditional disk drives (HDDs). Assessment is made of the delta between workload performance on SSDs and HDDs.
 3. Hardware configured to client specifications with client workloads run on a system in the Performance and Scalability Services Center in Rochester, MN. Client has onsite access to state of the art test center. Optimal SSD configuration for current and future workload requirements is determined from analysis of workload runs.

Typical Benefits

- “Real data” available to assess if SSDs are for you.
- Multiple offerings provide flexibility in the scope and depth of the analysis you choose to perform.
- With the assistance of our Lab Services experts, clients will learn how to optimize the use of SSDs to meet their processing and business requirements.

Contact

- To initiate these services, submit a request form at url:
<http://www.ibm.com/systems/services/labservices/psscontact.html>

Why IBM® Rochester?

- Deep skills in IBM i implementation and integration
- Experience in system, database, and application performance gleaned from hundreds of engagements with clients across most industries
- Ability to deliver skills transfer as part of your service engagement

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